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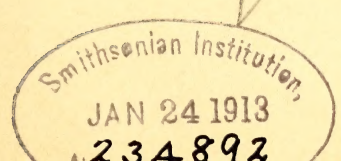
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<i>Abies</i>	83	<i>Barbula rigidula</i>	93
<i>Acer</i> sp.	84	“ <i>semitorta</i>	93
<i>Acrocladium cuspidatum</i>	39	“ <i>subfallax</i>	93
<i>Acrolejeunea torulosa</i>	63	“ <i>unguiculata</i>	39, 95
<i>Acutifolia</i>	74	“ <i>vinealis</i>	93
<i>Aesculus</i>	85	<i>Bartramia pomiformis</i>	39
<i>Alectoria</i>	30	<i>Bazzania deflexa</i>	89
“ <i>oregana</i>	86	“ <i>tricrenata</i>	89
<i>Alicularia</i>	34	“ <i>Black Egypt</i>	100
<i>Alsia circinalis</i>	93	<i>Blyttia</i>	34
“ <i>longipes</i>	93	<i>Brachiolejeunea bahamensis</i> n. sp.	91
<i>Amblystegiella adnata</i>	52	“ <i>bicolor</i>	62
<i>Amblystegium</i>	37	“ <i>corticalis</i>	62, 63
“ <i>compactum</i>	50	“ <i>densiflora</i>	62
“ <i>curvipes</i>	50	“ <i>densifolia</i>	62
“ <i>Hausmannii</i>	50	“ <i>insularis</i>	62
“ <i>hygrophilum</i>	50	<i>Brachythecium</i>	37
“ <i>irriguum</i>	95	“ <i>acuminatum</i> f.	95
“ <i>Juratzkanum</i>	50, 95	“ <i>Bolanderi</i>	93
“ <i>Kochii</i>	50	“ <i>californicum</i>	93
“ <i>leptophyllum</i>	50	“ <i>collinum</i>	39
“ <i>radicale</i>	50	“ <i>digastrum</i>	95
“ <i>rigescens</i>	50	“ <i>flexicaule</i>	39
“ <i>riparium</i>	39, 50, 93	“ <i>glareosum</i>	39
“ <i>serpens</i>	39, 50, 93	“ <i>plumosum</i>	39, 95
“ <i>trichopodium</i>	50	“ <i>populeum</i>	39
“ <i>varium</i>	93	“ <i>rivulare</i>	39
<i>Ampelopsis</i>	45	“ <i>rutabulum</i>	39, 93
<i>Amphidium lapponicum</i>	39	“ <i>salebrosum</i>	39
<i>Anacamptodon splachnoides</i>	95	“ <i>Starkei</i>	39
<i>Anacolia Menziesii</i>	93	“ <i>velutinum</i>	39
<i>Andreaea petrophila</i>	39	<i>Bryhnia novæ-angliæ</i>	39
<i>Aneura</i>	34	<i>Bryum argenteum</i>	39, 68, 93
“ <i>latifrons</i>	90	“ <i>cæspiticium</i>	39, 97
“ <i>multifida</i>	90	“ <i>capillare</i>	39, 68
“ <i>pinguis</i>	90	“ <i>inclinatum</i>	39
“ <i>pinnatifida</i>	90	“ <i>intermedium</i>	51, 95
“ <i>sessilis</i>	90	“ <i>longicolle</i>	51
<i>Anomodon</i>	42	“ <i>meeseoides</i>	51
“ <i>apiculatus</i>	39, 95	“ <i>neomexicanum</i>	51
“ <i>attenuatus</i>	39, 42	“ <i>obconicum</i>	93
“ <i>minor</i>	39	“ <i>pallens</i>	39
“ <i>rostratus</i>	39	“ <i>pallescens</i>	39
<i>Antitrichia californica</i>	93	“ <i>pendulum</i>	39
<i>Aphanorrhagma serratum</i>	95	“ <i>pseudotriquetrum</i>	39, 95
<i>Aplozia</i>	34	“ <i>torquescens</i>	39, 93
<i>Archilejeunea</i>	91	“ <i>turbinatum</i>	95
<i>Arnhonia polygramma</i>	83	<i>Buellia inquilina</i>	48
“ <i>radiata</i>	83	<i>Buxbaumia aphylla</i>	39
<i>Arthopyrenia biformis</i>	48	<i>Calicium hyperellum</i>	83
<i>Aschismae</i>	75	<i>Caloplaca cirrochroa</i>	86
<i>Asterella hemisphærica</i>	90	“ <i>gilva</i>	85
“ <i>tenella</i>	90	“ <i>murorum</i>	86
<i>Astomi</i>	75	“ <i>pollinii</i>	47
<i>Astomum crispum</i>	39	<i>Calypogeia Neesiana</i>	89
<i>Aulacomnium androgynum</i>	95	“ <i>sphagnicola</i>	89
“ <i>heterostichum</i>	39	“ <i>suecica</i>	89
“ <i>palustre</i>	39	“ <i>Sullivantii</i>	89
“ <i>turgidum</i>	39	“ <i>tenuis</i>	89
<i>Barbilophozia Hatcheri</i>	12	“ <i>Trichomanis</i>	11, 89
<i>Barbula convoluta</i>	39		
“ <i>muralis</i>	68		

<i>Camptothecium arenarium</i>	93	<i>Dicranum scoparium</i>	39
“ <i>pinnatifidum</i>	93	“ <i>strictum</i>	39
<i>Campyllum chrysophyllum</i>	39	“ <i>undulatum</i>	39
“ <i>polygamum</i>	39	<i>Didymodon rubellus</i>	39
<i>Campylopus flexuosus</i>	38	“ <i>tophaceus</i>	93
<i>Catharinea angustata</i>	39	<i>Diplophylla apiculata</i>	89
“ <i>undulata</i>	39, 67	“ <i>exsectaeformis</i> v.	
<i>Cephalozia connivens</i>	44	“ <i>aequiloba</i>	56
“ <i>divaricata</i>	89	“ <i>taxifolia</i>	89
“ <i>Francisci</i>	58	<i>Diplophyllum albicans</i> v. <i>taxi-</i>	
“ <i>lunulaefolia</i>	89	“ <i>folium</i>	89
“ <i>multiflora</i>	89	<i>Distichium capillaceum</i>	39
“ <i>serriiflora</i>	89	<i>Ditrichum flexicaule</i>	39
“ <i>Sullivantii</i>	89	“ <i>homomallum</i>	40
“ <i>virginiana</i>	89	“ <i>pallidum</i>	40
<i>Cephaloziella Hampeana</i>	89	“ <i>rhynchostegium</i>	96
“ <i>Starkii</i>	89	<i>Drummondia clavellata</i>	40
“ <i>Sullivantii</i>	89	<i>Echinodium</i>	32
<i>Ceratodon purpureus</i>	39, 68	“ <i>hispidum</i>	31
<i>Ceratolejeunea integrifolia</i> n. sp.	92	<i>Encalypta ciliata</i>	40
<i>Chaenotheca phaeocephala</i>	82	“ <i>vulgaris</i>	94
“ <i>phaeocephalum</i>	82	<i>Endocarpus intestiniforme</i>	46
<i>Cheilolejeunea</i>	61	<i>Eucalyx</i>	34
<i>Chiloscyphus ascendens</i>	89	<i>Eucladii</i>	75
“ <i>pallescens</i>	89	<i>Eucladium verticillatum</i>	94
<i>Cirriphyllum Bosci</i>	95	<i>Euosmolejeunea Montagnei</i>	59
<i>Claopodium Bolanderi</i>	42	<i>Eurhynchium</i>	41
“ <i>laxifolium</i>	42	“ <i>hians</i>	40
“ <i>leuconeurum</i>	42	“ <i>praelongum</i>	94
“	42, 43, 44, 93	<i>Fabronia octoblepharis</i>	43, 94
“ <i>pellucinerve</i>	43	“ <i>pusilla</i>	43
“ <i>Whippleanum</i>	42, 43, 44	<i>Fimbriaria tenella</i>	90
<i>Clastobryum americanum</i>	31	<i>Fissidens adiantoides</i>	40
“ <i>indicum</i>	31	“ <i>cristatus</i>	40
<i>Climacium dendroides</i>	39	“ <i>grandifrons</i>	95
“ <i>ruthenicum</i>	40	“ <i>limbatus</i>	94
<i>Collema</i>	84	“ <i>minutulus</i>	96
<i>Cololejeunea Biddlecomiae</i>	88	“ <i>obtusifolius</i>	96
“ <i>calcareae</i>	88	“ <i>osmundoides</i>	40
Cololejeunea Camilli comb.		“ <i>subbasilaris</i>	96
nov.	*54, 59, 60, 61	“ <i>taxifolius</i>	40
<i>Cololejeunea diaphana</i> n. sp., 60, 61, 91		<i>Floribundaria pendula</i>	40
“ <i>Montagnei</i>	59	<i>Fontinalis antipyretica</i>	40
<i>Cratoneuron commutatum</i>	39	“ <i>hypnoides</i>	40
<i>Crossosoma californicum</i>	46	<i>Fossombronia Dumortieri</i>	90
<i>Crossotolejeunea bermudiana</i>		“ <i>foveolata</i>	90
n. sp.	91	“ <i>pusilla</i>	90
<i>Cyanophyceae</i>	85	<i>Frullania</i>	22, 25, 67
<i>Cynodontium polycarpum</i>	39	“ <i>aeolotis</i>	88
Dermatocarpus intestiniforme		“ <i>arietina</i>	22
n. comb.	46	“ <i>Asagrayana</i>	62
<i>Desmatodon arenaceus</i>	93	“ <i>Bolanderi</i>	25
“ <i>Guepini</i>	93	“ <i>Brittoniae</i>	88
“ <i>nervosus</i>	93	“ <i>caroliniana</i>	22
“ <i>plinthobius</i>	93	“ <i>Catalinae</i>	26
“ <i>Porteri</i>	95	“ <i>cobrensis</i>	25, 26
<i>Dichodontium pellucidum</i>	39	“ <i>dilatata</i>	88
<i>Dicranella heteromalla</i>	39	“ <i>Donnellii</i>	22
“ <i>rufescens</i>	39	“ <i>eboracensis</i>	22, 25, 88
“ <i>squarrosa</i>	39	“ <i>fragilifolia</i>	88
<i>Dicranoweisia cirrhata</i>	93	“ <i>gibbosa</i>	22
“ <i>crispula</i>	39	“ <i>inflata</i>	25, 26
<i>Dicranum congestum</i>	39	“ <i>Kunzei</i>	22
“ <i>falcatum</i>	39	“ <i>Oakesiana</i>	26
“ <i>flagellare</i>	39	“ <i>obcordata</i>	22
“ <i>fulvellum</i>	39	“ <i>pennsylvanica</i>	88
“ <i>fuscescens</i>	68, 95	“ Rappii sp. nov.,	
“ <i>majus</i>	39	22, *24, 25, 26	
		<i>riparia</i>	88

<i>Frullania saxicola</i>	22, 26	<i>Jungermannia excisa crispa</i>	90
“ <i>Selwyniana</i>	88	“ <i>exsecta</i>	56
“ <i>squarrosa</i>	22, 25	“ <i>exsectaeformis</i>	56
“ <i>virginica</i>	22, 88	“ <i>fossombronioides</i>	90
<i>Funaria calcarea</i>	94	“ <i>Gillmani</i>	89
“ <i>convoluta</i>	94	“ <i>Hatcheri</i>	12
“ <i>hygrometrica</i> , 40, 67, 68, 94	94	“ <i>Helleriana</i>	90
<i>Galeiloba</i>	23	“ <i>incisa</i>	90
<i>Georgia geniculata</i>	40	“ <i>inflata</i>	90
“ <i>pellucida</i>	40	“ <i>lanceolata</i>	34, 89
<i>Grimaldia barbifrons</i>	90	“ <i>laxa</i>	90
“ <i>fragrans</i>	90	“ <i>Michauxii</i>	90
“ <i>rupestris</i>	90	“ <i>minuta</i>	90
<i>Grimmia apocarpa</i>	40, 68	“ <i>Schraderi</i>	89
“ <i>californica</i>	94	“ <i>scitula</i>	56
“ <i>leucophæa</i>	94	“ <i>setiformis</i>	90
“ <i>pilifera</i>	40	“ <i>ventricosa</i>	90
“ <i>trichophylla</i>	94	“ <i>Wallrothiana</i>	90
<i>Gymnomitrium adustum</i>	90	“ <i>Wattiana</i>	11, 89
<i>Gymnostomum calcareum</i>	40, 94	<i>Kalmia</i>	62
“ <i>læve</i> , 75, 76, 77, 78, 79, *80		<i>Kantia Sullivantii</i>	89
<i>Habrodon Notarisii</i>	43	“ <i>Trichomanis</i>	89
<i>Haplohymenium triste</i>	43	“ <i>tenuis</i>	89
<i>Haplozia</i>	34	<i>Lecania erysibe</i>	85
<i>Harpolejeunea reflexula</i> n. sp.	91	<i>Lecanora cirrochroa</i>	86
<i>Hedwigia albicans</i>	10, 40, 94	“ <i>melanaspis alphoplaca</i>	46
<i>Helodium paludosum</i>	40	“ <i>saxicola</i>	48
Heppia alumenensis sp. nov.	84	<i>Lecidea bullata</i> sp. nov.	45
<i>Herpetineuron Toccæ</i>	40	“ <i>leucophæa</i> f. <i>genuina</i>	47
<i>Heteromeles arbutifolia</i>	48	“ <i>ruginosa</i>	84
<i>Homalotheciella subcapillata</i>	96	Legania shastensis sp. nov.	85
<i>Homomallium adnatum</i>	40, 52	<i>Lirolejeunea grandiflora</i> sp. nov.	91
“ <i>mexicanum</i>	52	<i>Lejeunea calcarea</i>	88
“ <i>latifolium</i>	52	“ <i>Camilli</i>	59
<i>Hookeriaceæ</i>	27	“ <i>cavifolia</i>	88
<i>Hygroamblystegium filicinum</i>	40	“ <i>clypeata</i>	88
<i>Hygrohypnum</i>	37	“ <i>flava</i>	88
“ <i>molle</i>	40	“ <i>floridana</i> n. sp.	91
<i>Hylocomium brevirostre</i>	40	“ <i>lucens</i>	88
“ <i>proliferum</i>	40	“ <i>Montagnei</i>	59
“ <i>pyrenaicum</i>	40	“ <i>pililoba</i>	61
“ <i>umbratum</i>	40	“ <i>serpyllifolia americana</i>	88
<i>Hymenostomi</i>	75	“ <i>spiniloba</i>	61
<i>Hymenostylium curvirostre</i>	40	<i>Lejeuneæ</i>	54
<i>Hypnum</i>	41	<i>Lepidozia setacea</i>	44, 45
“ <i>aduncum</i>	68	“ <i>sylvatica</i>	44
“ <i>flexile</i>	29	<i>Leptobryum pyriforme</i>	40, 94
“ <i>leuconeurum</i>	44	<i>Leptocolea Jooriana</i>	23
“ <i>patientiæ</i>	96	<i>Leptodictyum trichopodium</i>	50
“ <i>Schreberi</i>	40	<i>Leptoscyphus</i>	34
“ <i>uncinatum</i>	40	<i>Leskea ? algarvica</i>	42, 44
“ <i>Whippleanum</i>	44	<i>Leskea gracilescens</i>	96
<i>Inophlœa</i> (Subgenus), 1, 3, 63, 64, 70, 71, 72, 73, 74		“ <i>obscura</i>	40
<i>Isopterygium silesiacum</i>	40	“ <i>polycarpa</i>	96
“ <i>turfæum</i>	40	<i>Leucobryum glaucum</i>	31
<i>Isothecium Brewerianum</i>	94	<i>Leucodoniopsis Camerooniæ</i>	28
<i>Jamesoniella</i>	34	“ <i>floridana</i>	*27, 28
“ <i>autumnalis</i>	89	“ <i>plicata</i>	26, 27, 28
<i>Jubula Hutchinsii</i> v. <i>Sullivantii</i>	88	<i>Leucodontaceæ</i>	28
“ <i>pennsylvanica</i>	88	<i>Leucodontopsis</i>	26
<i>Jungermannia</i>	34	“ floridana comb. nov.	28
“ <i>alpestris</i>	90	<i>Leucolejeunea clypeata</i> n. sp.	88, 91
“ <i>barbata</i>	89	“ <i>conchifolia</i> n. sp.	91
“ <i>attenuata</i>	90	“ <i>rotundistipula</i> n. sp.	91
“ <i>biformis</i>	90	“ <i>sp.</i>	91
“ <i>excisa</i>	90	“ <i>unciloba</i> n. sp.	91
		“ <i>zanthocarpa</i> n. sp.	91
		<i>Lichen erysibe</i>	85

Lichen phaeocephalus	82	Neckera cochlearifolia	29
Liocblana	34	“ (Pilotrichum?) floridana,	
“ lanceolata	89	“	27, 28
Litophloea (subgenus)	2, 3, 63, 74	“ pennata	40
Lophocolea Austini	89	“ pusilla	40
“ Hallii	89	“ turgescens	29
“ heterophylla	89	Neesiella rupestris	90
“ Macounii	89	Nephromopsis platyphylla	86
Lophozia	57	Nostoc	85
“ alpestris	90	Notothylas melanospora	90
“ attenuata	12, 90	“ orbicularis	90
“ badensis	11	Octoblepharum albidum	40
“ barbata	89	Odontolejeunea longispica n. sp.	91
“ Baueriana	12	Odontoschisma prostratum	89
“ bicrenata	90	“ sphagni	89
“ excisa	35, 90	Oncophorus virens	40
“ exsecta scitula	56	“ Wahlenbergii	40
“ Floerkei	12	Opegrapha abnormis	83
“ heterocolpa	11, 12, 89	“ atra	84
“ incisa	90	Orthotrichum Bolanderi	94
“ inflata	89, 90	“ cylindrocarpum	94
“ Kaurini	11, 12	“ fastigiatum	40
“ longiflora	35	“ Lyellii	94
“ lycopodioides	12	“ Porteri	96
“ marchica	90	“ Rogeri	40
“ Muellerei	11, 12	“ rupestre	94
“ porphyroleuca	35	“ speciosum	67
“ ventricosa	35, 90	Oxyrrhynchium praelongum	40
Lunularia cruciata	90	“ rusciforme	40
“ vulgaris	90	Pallavicinia	34
Marsupella adusta	90	“ Flotowiana	55
“ ustulata	90	“ hibernica	54, 55
Meteorium	27	“ Lyellii	54, 55
“ flexilis	29	Parmelia enteromorpha	86
Metzgeria disciformis	92	“ olivaria	85
“ oligotricha n. sp.	92	“ perlata B. olivaria	85
“ uncigera n. sp.	92	Pedinophyllum interruptum	89
“ vivipara n. sp.	92	Pellia calycina	90
Microlejeunea bullata	23	“ endiviaefolia	90
“ latevirens	88	“ Fabroniana	90
“ Ruthei	62	“ Neesiana	90
Mniobryum albicans	40, 94, 96	Philonotis fontana	40
Mnium	38	Phragmicoma bicolor	62
“ affine	40	Physcomitrium acuminatum	40
“ cinclidioides	40	Pilotrichella cochlearifolia	29
“ flagellare	10	“ erosa-mucronata	29
“ hornum	68	“ flexilis	29
“ marginatum	96	“ robusta	29
“ medium	40	“ floridana	28
“ orthorhynchum	40	“ recurvo-mucronata	29
“ punctatum	40	“ turgescens	29
“ rostratum	40, 67	Pinus ponderosa	86
“ serratum	40	Pirea cymbifolia	27
“ silvaticum	40	“ Ludovicæ	27
“ stellare	40	Placodium cirrochroum	86
Moerckia	34	“ ferrugineum pollinii	47
Molendoa tenuinervis	75, 79	Plagiogchila	62
Mycoporellum ellipticum	46	“ asplenioides	89
“ Eschweileri	46	“ interrupta	89
“ Hassei sp. nov.	46	“ porelloides	89
“ Lahmi	46	“ Smallii n. sp.	91
Mylia	34	“ spinulosa	89
“ anomala	44	“ Sullivantii	89
Myurella gracilis	96	Plagiopus oederi	40
Nardia	34	Plagiothecium denticulatum	40
“ biformis	90	“ geophilum	69
“ fossombronioides	90	“ lætum neomexi-	
“ geoscyphus	55	“ canum	52
Neckera	52	“ micans	96

<i>Plagiothecium piliferum</i>	40	<i>Riccia fluitans</i>	91
“ <i>silvaticum</i>	40	“ “ <i>v. Sullivantii</i>	91
“ <i>striatellum</i>	96	“ <i>lamellosa</i>	90
“ <i>sylvaticum</i>	96	“ <i>lutescens</i>	91
“ <i>turfaceum</i>	96	“ <i>natans</i>	91
<i>Platygyrium repens</i>	96	“ <i>tenuis</i>	91
<i>Pleuridium Bolanderi</i>	94	<i>Ricciella crystallina</i>	90
<i>Pleuroziopsis ruthenica</i>	40	“ <i>fluitans</i>	91
<i>Pogonatum contortum</i>	40	“ <i>membranacea</i>	91
“ <i>urnigerum</i>	40	“ <i>Sullivantii</i>	91
<i>Pohlia nutans</i>	95, 96	<i>Ricciocarpus natans</i>	91
<i>Polyblastia intercedens</i>	82	<i>Saëlania glaucescens</i>	41
<i>Polytrichum alpinum</i>	40	<i>Scapania dentata</i>	89
“ <i>commune</i>	40, 100	“ <i>exsecta</i>	56, 89
“ <i>formosum</i>	40	“ <i>Oakesii</i>	89
“ <i>gracile</i>	40	“ <i>portoricensis</i>	58
“ <i>juniperinum</i>	40	<i>Schizopelte californica</i>	47
“ <i>piliferum</i>	40, 94	<i>Scleropodium apocladum</i>	94
<i>Porella dentata</i>	89	“ <i>illecebrum</i>	94
“ <i>pinnata</i>	89	“ <i>obtusifolium</i>	94
“ <i>platyphylla</i>	89	“ <i>purum</i>	41
“ <i>rivularis</i>	89	<i>Scytonema</i>	84, 85
“ <i>Sullivantii</i>	89	<i>Southbya</i>	34
“ <i>Thuja</i>	88, 89	<i>Sphaerocarpus terrestris</i>	91
<i>Porotrichum alopecurum</i>	32	“ <i>texanus</i>	91
<i>Porothamnium Bigelovii</i>	52	<i>Sphagna</i>	37
“ <i>? neomexicanum</i>	52	<i>Sphagnum</i>	2, 3, 44, 45, 65
<i>Pottia intermedia</i>	40	“ <i>acutifolium</i>	41, 44
<i>Pressia commutata</i>	90	“ <i>affine</i>	6
“ <i>quadrata</i>	11, 90	“ <i>alegrense</i>	9
<i>Pseudoleskea</i>	43	“ <i>Bartlettii</i>	9
<i>Pseudotsuga taxifolia</i>	86	“ <i>brevicaule</i>	66
<i>Pterigynandrum filiforme</i>	40	“ <i>centrale</i>	70, 71, 72
<i>Pterogonium gracile</i>	40, 94	“ <i>compactum</i>	70
<i>Ptilidium ciliare</i>	89	“ <i>cubense</i>	66
“ <i>crista-castrensis</i>	40	“ <i>cuspidatum</i>	41
“ <i>pulcherrimum</i>	89	“ <i>cyclophyllum</i>	73
<i>Ptychocoleus polycarpus</i>	63	“ <i>cymbifolium</i>	7, 41, 64, 66, 72
“ <i>torulosus</i>	62, 63	“ “ <i>ludovicianum</i>	64
<i>Pylaisia intricata</i>	40	“ <i>degenerans</i>	6
“ <i>polyantha</i>	40	“ <i>Earlei</i>	66
<i>Radula</i>	62	“ <i>erythrocalyx</i>	64, 65, 66, 70, 73, 74
<i>Raphidostegium carolinianum</i>	96	“ <i>fimbriatum</i>	41
“ “ <i>admixtum</i>	96	“ <i>fusum</i>	41
“ “ <i>demissum</i>	41	“ <i>Girgensohnii</i>	41, 96
“ “ <i>marylandicum</i>	96	“ <i>guadelupense</i>	65, 66
<i>Reboulia hemisphaerica</i>	90	“ <i>Guyoni</i>	65
<i>Rectolejeunea Brittoniae</i> n. sp.	92	“ <i>Harperi</i>	66
<i>Rhabdoweisia fugax</i>	41, 96	“ <i>Henryense</i>	8, 9, 74
<i>Rhacomitrium aciculare</i>	41	“ “ <i>Bartlettii</i>	9
“ <i>canescens</i>	41, 67	“ <i>Huntii</i>	66
“ <i>fasciculare</i>	41	“ <i>Husnoti</i>	65
“ <i>heterostichum</i>	41	“ <i>imbricatum</i> 2, 3, 4, 6, 7, 9, 41, 70, 73, 74	
“ <i>lanuginosum</i>	41	“ “ <i>affine</i> 7, 8, 96	
“ <i>patens</i>	41	“ <i>intermedium</i>	71, 72
“ <i>sudeticum</i>	41	“ <i>ludovicianum</i>	64
“ <i>varium</i>	41	“ <i>magellanicum</i> 70, 71, 72, 73, 74, 96	
<i>Rhodobryum roseum</i>	41	“ <i>medium</i>	65, 70, 72
<i>Rhytidiadelphus squarrosus</i>	41	“ “ <i>papillosum</i>	65
“ <i>triquetrus</i>	41	“ <i>meridense versicolor</i>	70
<i>Rhytidium rugosum</i>	41	“ <i>molle</i>	41
<i>Riccardia</i>	34	“ <i>molluscum</i>	41
“ <i>latifrons</i>	90	“ <i>palustre</i> 6, 7, 8, 9, 63, 64, 71, 72, 73, 74	
“ <i>multifida</i>	90		
“ <i>pinguis</i>	90		
“ <i>sinuata</i>	90		
<i>Riccia Austini</i>	90		
“ <i>crystallina</i>	90		

Sphagnum palustre affine	6	Thuidicum leskeoides	44
“ “ subsp. inter- medium	71	“ leuconeurum	44
“ papillosum, 8, 41, 63, 64, 65, 71, 72, 73, 74	74	“ microphyllum	97
“ perichætiale	65	“ minutulum	41
“ portoricense, 2, 3, 4, 9, 65, 70, 73, 74	74	“ punctulatum	42
“ pseudocymbifolium	8	“ quadrifarium	41
“ pseudomedium	72	“ Solmsii	44
“ pulchrum	73	“ virginianum	97
“ Pylæsii	73	Timmiella flexisetæ	94
“ recurvum	41, 96	“ vancouverensis	94
“ Russowii	41	Toninia ruginosa	84
“ Sintenisii	66	Tortella cæspitosa	41
“ squarrosum	41	“ tortuosa	41
“ subbicolor, 9, 70, 71, 72	72	Tortula brevipes	94
“ subnitens	41	“ muralis	38, 94
“ subsecundum	41, 73	“ princeps	94
“ turfaceum	7, 8	“ ruralis	94
“ Waghornei	64	Trachycolea (subgenus)	23, 25, 26
“ Wrightii	66	Trachylejeunea dilatata n. sp.	91
Sphenolobus exsectæformis	56, 57, 58	Trematodon longicollis	41, 43
“ “ æqui- loba, 56, 57	56, 57	Trichocolea Biddlecomiæ	89
“ exsectus	56, 57, 89	“ tomentella	89
“ Hellerianus	90	Trichostomum cylindricum	41
“ Michauxii	90	Trimmatothele umbellulariæ sp. nov.	82
“ minutus	90	Ulotæ americana	41
“ politus	58	“ Ludwigii	67, 97
“ scitulus, 54, 56, 57, 58	58	Umbellularia californica	82, 84
Stereodon arcuatiformis	41	Usnea	29, 80
“ arcuatus	41	“ angulata	36
“ circinalis	41	“ articulata	30
“ cupressiformis	41	“ barbata plicata	30
“ curvifolius	41	“ cavernosa	30
“ fertilis	41	“ ceratina	30
“ Haldanianus	41	“ “ f. subplicata	30
“ imponens	41	“ florida	29
“ plicatulus	41	“ “ f. strigosa	29
“ pratensis	41	“ jamaicensis	30
“ reptilis	41	“ longissima	30
Stictæ	35	“ plicata	30
Symbeididium laceratum n. sp.	91	“ trichodea	30
Taxilejeunea obtusangula n. sp.	92	Vaccinium macrocarpon	73
Temnoma setiforme	90	Verrucaria bifermis	48
Tetraplodon angustatus	41	“ intercedens	82
Tetraplodon mnioides	41	Webera annotina	41
Thamnium alopecurum	41	“ cruda	41
Thuidicum delicatulum	41	“ elongata	41
		“ longicolla	41
		Weisia viridula	41, 94

INDEX TO TITLES

Abnormality in Moss Leaves (<i>Illus.</i>) H. N. Dixon	38	Exchange Department— 17, 37, 53, 69, 87, 100	
Additions to the Lichen Flora of Southern California, No. 7. H. E. Hasse, M.D.	45-48	Further Notes on the North American Distribution of the Genus Usnea. R. Heber Howe, Jr.	29, 30
Additions to the Recorded Mosses of West Virginia. John L. Sheldon	95-97	Hedwigia albicans (Web.) Lindb. on Limestone. H. S. Jewett, M. D.	11
Annual Reports S. M. Society	13-17	Helpful Literature for Students of North American Hepaticæ. Caroline Coventry Haynes. (Includes lists of new species.)	91-93
Brief Notes on the Distribution of Hepaticæ. George H. Conklin, M. D.	11, 12	Hepaticæ of the Sixth Edition of Gray's Manual Compared with The Exchange List. George Hall Conklin	88-91
Correction, A. By H. S. Jewett, M. D.	69		
A New Frullania from Florida (<i>Illus.</i>). Alexander W. Evans	22-26		

Leucodontopsis Cardot (<i>Illus.</i>)	
Elizabeth G. Britton	26-28
List of Mosses Collected in South- ern California. C. C. Kingman.	93-95
Meeting of the S. M. Society in Washington, D. C. Edward B. Chamberlain	35, 36
Mnium flagellare S. & L. in N. A. (<i>Illus.</i>). R. S. Williams	10
Molendnea tenuinervis Limpr. in America Arctica (<i>Illus.</i>). I. Györfy	75-81
Mosses as a Factor in Land Con- servation. A. J. Grout	37
Mosses Common to N. A. and Jap- an. E. Iishiba. Edited by J. M. Holzinger (194 species).	39-41
Necrology—	
Paris, Jean Gabriel Edward	97, 98
Levier, Dr. E.	98
Hooker, Sir Joseph Dalton	98
New North American Mosses of Jules Cardot. A. J. Grout.	51-53
New or Rare Californian Lichens. Albert W. C. T. Herre	81-87
Note on Mosses Growing Unat- tached. H. N. Dixon	31, 32
Notes—A. J. Grout	53
Notes on Lepidozia setacea. E. J. Hill	44, 45
Notes on North American Hepati- cæ III (<i>Illus.</i>). Alexander W. Evans	54-63
Notes on North American Sphag- num II. Subgenus Inophloeæ. A. LeRoy Andrews, Ph.D. 1-9	
Notes on North American Sphag- num III. A. LeRoy Andrews	63-66
Notes on N. A. Sphagnum IV. A. LeRoy Andrews	70-74
Notes on the Mosses of Jamaica. Elizabeth G. Britton	28, 29
Notice, Election Officers for 1913.	100
On the Resistance of Mosses to Drying and to Cold. Trans. etc. L. W. Riddle	67-69
Philippine Bryophytes and Li- chens. C. B. Robinson	32, 33
Photographing Mosses. A. J. Grout	97
Reviews—Helpful Literature	91
Leopold Loeske: Revision einiger Amblystegien aus der Herbare Limpricht	50
A Recent Contribution to the Ecology of Mosses	67-69
The Juvenile Forms of Mos- ses and their Culture (P. Janzen)	99, 100
Die Lebermoose in Raben- horst's Kryptogamen-Flora (K. Müller)	33-35
Leopold Loeske: Studies in Comparative Morphology and the Phylogenetic Taxo- nomy of Mosses	48-50

Student's Handbook of Brit- ish Hepatics (S. M. Macvicar)	99
Sullivant Moss Society Notes—	17, 36, 69, 87
The Genus Claopodium in Europe. Wm. Edward Nicholson	41-44
The Genus Clastobryum Doz. and Molk. in America. R. S. Wil- liams	31

INDEX TO AUTHORS

Andrews, A. LeRoy, 1-9; 63-66; 70-74	
Bailey, H. B.	100
Britton, Elizabeth G.	26-29
Cardot, Jules (Transl.)	51-53
Chamberlain, Edward B.	35, 36, 50
Conklin, George Hall. 15, 16, 88-91	
Dixon, H. N.	31, 32, 38
Evans, Alexander W. 13, 22-26, 54-63	
Grout, A. J.	37, 51-53, 97, 99
Györfy, I.	75-81
Hasse, H. E.	45-48
Haynes, C. C.	91-93
Herre, Albert W. C. T.	81-87
Hill, E. J.	44, 45
Holzinger, John M.—	39-41, 48-50, 99-100
Iishiba, E.	39-41
Jewett, H. S.	10, 69
Kaiser, George B.	13, 14
Kingman, C. C.	93-95
Miller, Mary F.	14, 15
Nicholson, Wm. Edward	41-44
Riddle, L. W.	67-69
Robinson, C. B.	32, 33
Sheldon, John L.	95-97
Smith, Annie Morrill	16, 97, 98
Warner, Edith A.	17
Williams, R. S.	10, 31

ERRATA

- Page 11, line 7 from bottom, for *Wattiana*, read *Wattiana*.
- Page 65, lines 10 and 15 from bottom, for *guadalupense*, read *guadelupense*.
- Page 66, add following to bottom of page: "and that of both to *S. papillosum*."⁸ I must also refer to two specimens of "
- Page 71, line 6, for *si ed*, read *sized*.
- Page 71, line 14, for *eld*, read *el*.
- Page 71, line 16, for *an*-, read *and*.
- Page 72, line 19, for *pecies*, read *species*.
- Page 73, line 15, for *overly*, read *overlay*.
- Page 75, line 8 from bottom, for *Kristiana* read *Kristiania*.
- Page 82, line 1, for INTERCEDENS, read INTERCEDENS.
- Page 83, line 14 from bottom, for *park*, read *Park*.
- Page 84, line 1 from bottom, ditto.
- Page 93, line 5, for *Highlands, N. Y.*, read *Highlands, N. J.*
- Page 94, line 28, first column, for *trichobhylla*, read *trichobhylla*.

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CONTENTS

✓ Notes on North American Sphagnum, II	<i>A. Le Roy Andrews</i>	1
✓ Mnium flagellare Sull. & Lesq. in North America,	<i>R. S. Williams</i>	10
✓ Hedwigia albicans on Limestone,	<i>H. S. Jewett</i>	10
✓ Brief notes on the Distribution of Hepaticae,	<i>George H. Conklin</i>	11
Reports of the Officers and Custodians of the Sullivant Moss Society,		13
Sullivant Moss Society Notes,		17
Report of Elections,		17
Exchange Department,		17
List of Sullivant Moss Society Members 1912,		17

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THE BRYOLOGIST

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No. 1

NOTES ON NORTH AMERICAN SPHAGNUM, II

A. LEROY ANDREWS, PH. D.

THE SUBGENUS INOPHLOEA RUSSOW

Members of this group can readily be recognized as such in the field; if the large size and general aspect of the plants leave any doubt, it may readily be dispelled by examination under a hand-lens, as the cucullate leaf apices are unmistakable. Its species themselves are on the other hand most difficult to distinguish from each other without microscopical investigation, and show even then very close relationship. Long acquaintance in the field may lead one to suspect the specific identity of a newly found tuft of plants, or in some cases to be certain of it, but the group remains the hardest of all to collect with discrimination.

The stem leaves of all species of this group show the membrane of the hyaline cells almost completely or very largely resorbed on the outer surface. This matter of membrane resorption, studied most thoroughly by Russow, is to my mind one whose importance has not been adequately recognized in the systematic treatment of the genus. It occurs especially in the stem leaves, in some species also in the perichaetial leaves, sometimes on the one surface, sometimes on the other, sometimes on both. For its observation the leaf may be stained, but with good light and no condenser staining is superfluous. The membrane appears lacking in large gaps of more or less irregular form, but never with ragged outline, leaving often but a narrow border of membrane along the outer edge of the hyaline cell like a coating of ice about the edge of a pool; sometimes this is restricted to the two ends of the cell, or it may be so completely resorbed that no perceptible trace remains, in which last case one may easily fail to notice the lack of membrane. One's observation of the surface should be tested by transverse section, which leaves the condition unmistakable. A number of thin sections of the stem are sure to give some sections of stem leaves that can be used.

With reference to the structure of the perichaetial leaves already referred to, the statement of Warnstorff's descriptions that the basal and central portion is composed exclusively of chlorophyll cells is misleading in that one is likely to interpret it as referring to cells quite of the nature of the chlorophyll cells of the normal leaf structure, which is far from being the case. A transverse section of these

perichaetial leaves is very instructive, as, if taken from the middle or basal portion of the leaf, it shows toward either end the normal alternation of large empty cells and small chlorophyll ones; after a shorter or longer distance, according to the species and the proximity of the section to the base of leaf, the chlorophyll cells become much enlarged, the others relatively smaller, until all are uniform. These uniform cells have their common walls pitted, they may contain as Russow noted, scattered chlorophyll grains, but appear otherwise empty, at least in case of plants with mature capsules; in fact a section of the dry perichaetial leaves shows them almost entirely collapsed; if water be applied to such a section under the microscope, the walls can be seen to immediately spring apart (this test may also be applied to leaves lying flat on the slide) and present then in hexagonal outline with outer walls projecting angularly, an accordion effect, which on sufficient soaking goes over, at least in part, to a series of nearly rectangular cells. The transverse contractibility of the perichaetial leaves is greatly increased by this cellular structure, in which fact its physiological function is, perhaps to be sought.

The antheridial leaves of this subgenus present very little, if any, difference from normal branch leaves, and antheridia are not easy to find in herbarium material. Observations upon the organs of fructification of *Sphagnum*, preferably from the field and from fresh specimens, are much needed; so far as observed all species of this subgenus are always dioicous.

The subgenus is cosmopolitan in its distribution; only to the northward it probably does not extend quite as far as *Litophloea*: at any rate it is not yet known from Greenland or Spitzbergen.⁽¹⁾

1. *Sphagnum portoricense* Hampe, 1852. Warnstorf once expended a whole article upon the proof that this species was not distinct from *S. imbricatum* Hornsch.⁽²⁾ only to reverse his decision the year after, his attention in the meantime having been called by Schliephacke to the walls of the cortical cells of the branches.⁽³⁾ But this character had already been mentioned in a number of works and very clearly figured in no less than three.⁽⁴⁾ I allude to the fact because of its interest in connection with the history of the species, also because it illustrates two weaknesses of Warnstorf which we shall find frequently leading him into error: 1. an insufficient consideration of the work of other botanists, 2. unreliability in observations involving minute microscop-

(1) Cf. C. Jensen, *Musci Asiae borealis* III, 5. 1909.

(2) *Hedwigia*, 28: 303-8. *pl. VIII and IX*. 1889.

(3) *L. c.* 29: 67, *f.* 1890.

(4) *Sullivant, Icon. Musc.* 3. *f. pl. 2.* 1864; *Braithwaite, Month. Microsc. Jour.* 14: 47. *f., pl. CX.* 1875. *Sphagnaceae of Europe and North America*, 32, *f., pl. II.* 1880.

cal detail. Warnstorf's article is in spite of the oversight by no means without interest and value, and the close relationship of *S. portoricense* and *S. imbricatum* is indubitable, as had in fact been recognized before.

Both species are best separable from others of the group by the fact that their branch leaves in transverse section show the chlorophyll cells about equilaterally triangular with base of triangle exposed on inner surface of leaf and that the inner walls of their hyaline cells where in contact with these are normally beset by so-called fringe-fibrils, a series of close, nearly parallel, somewhat irregularly running ridges.

S. portoricense is distinguished from its parent species (for this is certainly the relation between the two) by its usually greater size, the more distinct hyaline border of its stem and branch leaves, by its strong horizontally spreading branches whose leaves increase gradually from the base, giving the branches a clavate effect, by the important difference in cortical cells of branches, and finally by the fact that its lower branch leaves are very short, in some cases wider than long, and all are more or less distinctly cordate at base, particularly, however, the lower ones.

The leaf border in *Inophloea*, best represented in the stem and lower branch leaves of this species, is something entirely different from the border of *Litophloea* in that it is a border of resorption. If examined closely in section and from both sides of the surface, it will be found to consist of a single plate of hyaline membrane with a fine mesh of darker lines, suggesting the remains of obsolete chlorophyll cells, though the mesh is much finer and must play a part in maintaining the rigidity of this rather broad but thin margin. This marginal membrane is a continuation of the inner leaf surface (the outer being here completely resorbed away), its outer edge is very irregular in outline, as is well illustrated in Warnstorf's figures in the article alluded to.

As to the cortical cells of branches, it may be noted generally that all species of *Sphagnum* show at base of branches a cortex resembling that of the stem, except that its cells do not constitute so many layers; usually the differentiated branch cortex shows its most characteristic development at about the middle of the branch, where the branch leaves are also best developed. In the case of *S. portoricense* the strong branches show a cortex most distinct well toward or quite at the apex, where the branch leaves are also largest and most characteristic, i. e. most differentiated from the stem leaves. The first noticeable peculiarity of these cells in *S. portoricense*, apart from their much greater size, is the fact that their outer walls do not show the pores usually present in other species of *Inophloea*, a fact noted already by Sullivant; secondly, the dividing wall between each

of these cells and that next below it in vertical series is not a plane one, but projects saccately, or in extreme cases in funnel form into the cell next below, providing connection with it by a pore at the end of the funnel.

These characters seem to distinguish the form amply from its parent species, *S. imbricatum*, but it is not inconceivable that further study of it in the field may reveal more nearly intergrading forms. Its range falls essentially within that of *S. imbricatum* and that in a characteristic region, which has more than all others in North America evolved secondary forms from species of more general distribution in the northern hemisphere. I have seen specimens of it from New Jersey, Georgia, Florida and the West Indian island of Guadeloupe, which with the original Portorican station represent its present known range. It is in New Jersey aquatic in its preferences, being found according to Austin in shallow ponds. Further observations and collections are very desirable, as its reproductive organs and fruit are entirely unknown.

2. *Sphagnum imbricatum* Hornschuch, 1865. Russow's publication of Hornschuch's herbarium name of this species ⁽¹⁾ is generally regarded as adequate, though it contains no full description, hardly more in fact than mention of a single characteristic feature, but that of such a sort that there is no mistaking the plant's specific identity. Under the previous species we have already characterized it in the main; where the fringe-fibrils are present they are a sufficient diagnostic character, except in so far as it might be confused with *S. portoricense*; it must be noted, however, that they are not necessarily present throughout the leaf, but may be lacking in a greater or less portion from the apex downward, in some specimens occurring only in a few cells of the middle basal part and in the variety lacking entirely. There is in this feature constancy only in that in a given tuft of plants one finds the branch leaves of the various plants very closely similar, but in a number of collections all degrees may be represented, so that a division at any point becomes an arbitrary one.

An interesting character of this species was observed by Russow ⁽²⁾, but his description of it seems to me not altogether accurate. It has to do with the fibrils in the cortical cells of stem and branches. If one examine the inner walls of these cells where they are in contact with the wood-cylinder, one finds a very notable and, so far as I have observed, entirely constant difference in that *S. imbricatum* (with *S. portoricense*) shows here not the normal continuation of the fibril-bands of the rest

(1) Russow, Beitrage zur Kenntnis der Torfmoose, 21. Dorpat, 1865.

(2) Zur Kenntnis der Subsecundum und Cymbifoliumgruppe der Torfmoose, 74, 93, 95. 1894.

of the inner wall, but a corrugated surface with alternate parallel ridges and grooves, the ridges continuing the spiral direction of the fibrils, being lower and less sharp in section though very much closer than the fibrils which they supplant. Russow did not differentiate these corrugations, except as to number, from the fibrils. A branch stripped of its leaves is easily examined with reference to this point, as it is generally possible to focus through the cortical cells without further cutting.

The type specimen of the species was from Kamchatka. For its North American distribution it is for the most part a coastal plant, ranging on the east coast from Newfoundland southward to Georgia, Alabama and Mississippi, and represented in a single collection from Cuba, being found once as far inland as Indiana. On the West its distribution is high northern, a couple stations on Alaskan islands forming with two Kamchatkan ones, one in East Siberia and a new one in Japan (Aramaki, Rikuzen, 27-5-1909, leg. Nematsu, comm. Iishiba) a somewhat isolated area, connecting neither through Asia nor North America with the European-eastern-North-American field of more general distribution. Another isolated area is represented at present by a single recorded station, the island of Chiloe off the coast of southern Chili.⁽¹⁾ This last almost startling fact of specific distribution is matched by that of several other species of *Sphagnum* as we shall see.⁽²⁾ Its European distribution agrees in general with its eastern North American, in that it is mostly coastal, though reaching as far inland as the mountains of Styria in Austria, and that it does not reach a very high northern latitude nor a high altitude. Most instructive as to its European habitat is the information and map furnished by K. F. Dusén with reference to its Scandinavian provenience.⁽³⁾ The northern limit set by him for its distribution on the western coast of Norway was somewhat confirmed by the experience of Kaalaas and the author, who failed to find it in extensive collections made along the coast of Söndmøre in the summer of 1907, though Kaalaas reports collecting it once previously in Orstenvik a trifle further north than Dusén's limit.⁽⁴⁾

The species may be sought anywhere along our eastern coast in usually compact masses of not over robust plants, often tinged brown-

(1) Cf. Braithwaite, *Sphagnaceae of Europe and North America*, 35. 1880.

(2) Braithwaite's statement of the collection of fertile (fruiting?) specimens of this species by Capt. King in Chiloe may rest upon a wrong identification. At any rate a specimen (fruiting) from the Mitten collection now in the herbarium of the N. Y. Botanical Garden labelled "*S. cymbifolium*, Chiloe, Capt. King" is *S. magellanicum*, the characteristic species of *Inophloea* in that region.

(3) Om *Sphagnaceernas* Utbredning i Skandinavien, 52, ff. 103, 121 f. Upsala, 1887.

(4) Bryophyten in Romsdals Amt. (Norske Videnskabers Selskabs Skrifter, No. 7 1910) 42. 1911.

ish, not infrequently associated with *S. palustre*, from which it is not easily distinguished without microscopical examination.

Var. *affine* (R. & C.) Warnstorf, 1889. This aspect of our species, first proposed as an independent species (*S. affine*) and well characterized by Renauld and Cardot⁽¹⁾, was correctly interpreted by Warnstorf. It differs from typical plants only in the complete lack of fringe-fibrils on inner walls of its hyaline leaf cells, in which character, as already noted, all degrees of transition are found. Its retention as a variety is desirable for practical reasons, as calling attention to this direction of variation and preventing confusion of this with the following species, *S. palustre*. From that species our variety is distinct by several characters, any one of which may in occasional specimens be found somewhat less strongly marked than normal. Most reliable is the leaf section which in *S. imbricatum*, as already noted, shows chlorophyll cells equilaterally triangular with hyaline cells very strongly convex on the dorsal surface, while *S. palustre* has chlorophyll cells isosceles triangular with short base and hyaline cells much less strongly convex on dorsal surface. The hyaline cells of the branch leaves of *S. imbricatum* show a membrane on the inner surface relatively more porose than that of *S. palustre* (at any rate in the case of the variety and the typical plants found within the variety's range), having large pores in a single row in each cell, even in those of the central part of the leaf, a condition foreign to *S. palustre*. This character of *S. imbricatum* is admirably shown by Roth's figure⁽²⁾ though he gives no corresponding figure of *S. palustre* with which to compare it. Similarly the outer membrane of the cortical cells of the stem of *S. imbricatum* is relatively more porose: in this species I have counted up to 10 pores per cell. The stem leaves of *S. imbricatum* are very constant in smaller size than in *S. palustre*, in a more spatulate or nearly quadrangular and less oval form, more distinct hyaline margin and complete lack of fibril-bands in hyaline cells, points again well illustrated by Roth's figures.⁽³⁾ In the perichaetial leaves the border region of normal alternating cells is relatively narrower in *S. imbricatum*. Relying primarily upon the leaf section, but taking into consideration at the same time the other points mentioned one should have no trouble in separating *S. imbricatum* var. *affine* from the next related *S. palustre*.

In spite of Warnstorf's correct identification of this variety, it is questionable whether he fully understood it, as his *S. degenerans*⁽¹⁾ and

(1) Rev. bryol. **12**: 44. 1885.

(2) Die europaeischen Torfmoose, *pl. I*, fig. 2d. 1906.

(3) L. c., fig. 2a; cf. 1a.

(4) Bot. Centralbl. **42**: 102. 1890.

S. turfaceum⁽¹⁾ reduced by Russow⁽²⁾ and Limpricht⁽³⁾ to *S. palustre* he still insists⁽⁴⁾ are *S. imbricatum* var. *affine*. I can express no independent opinion upon the European forms in question, though I have little doubt from the literature mentioned that Russow and Limpricht are right; however, I can state very definitely that North American specimens from the Pacific coast region ascribed by Warnstorf to *S. turfaceum* and later with the withdrawal of that species, labelled *S. imbricatum* var. *affine* are *S. palustre*, the variety of *S. imbricatum* being entirely unknown from our Pacific coast, in fact from the whole region of distribution of *S. imbricatum* except Europe and eastern North America. Within this range it seems to be infrequent in Europe and in eastern North America hardly reaches as far south as the typical form. Along the New England coast it is abundant; it has been found as far from the coast as West Virginia.

3. *Sphagnum palustre* Linné 1753. Though it may seem strange to bryologists to see the familiar *S. cymbifolium* displaced by this older Linnean name, the restoration goes back to Lindberg, who studied the Dillenian herbarium and recognized the identity of the specimen in question.⁽⁵⁾ The species is in its typical form easily determinable, but its delimitation in either direction difficult. Its branch leaves show in section chlorophyll cells isosceles triangular with narrow base, straight or outwardly curving legs, thin walls, triangular to somewhat ovate-triangular lumen. The plant thus characterized is the most common of the subgenus in the northern hemisphere, where it is very generally distributed; though it has been regarded as cosmopolitan, its occurrence in the southern hemisphere is much in need of further investigation; in the case of South American specimens I have seen none that seemed clearly referable to this species, nor does Warnstorf accredit it to Central or South America.⁽⁶⁾ In North America it is common from Newfoundland southward to the Gulf states (Florida to Texas), from California to Alaska and far inland. This occurrence well throughout the north temperate zone seems to correspond with its distribution in Europe and Asia.

Under somewhat abnormal conditions the chlorophyll cells may be relatively more strongly developed, becoming wider and more or less trapezoidal in section, with bases exposed on both surfaces of

- (1) Schriften der Naturf. Ges. Danzig, N. F., IX Bd., 2 Hft. 1896; I have not seen this description.
- (2) Zur Kenntnis der Subsecundum und Cymbifoliumgruppe europäischer Torfmoose, 90. 1894.
- (3) Rabenhorst, Kryptogamenflora 4³: 605. 1901.
- (4) Kryptogamenflora der Mark Brandenburg 1: 325. 1903.
- (5) Europas och Nord Amerikas Hvitmossor, 21. 1882; Kritisk Granskning af Mossorna uti Dillenii Historia Muscorum, 13. 1883; cf. also Druce and Vines, The Dillenian Herbarium, 202. 1907.
- (6) Hedwigia 33: 336. 1894.

leaf, a fact apparently explaining the origin of the synonyms *S. degenerans* Warnst. and *S. turfaceum* Warnst. already mentioned. It should be said at the same time that specimens of *S. palustre* from our Pacific coast tend to have chlorophyll cells with a broad base, possible of confusion with *S. imbricatum* var. *affine* if one examine with reference to this character alone and that without sectioning the leaf. Both the section and the other characters place them with *S. palustre*. If the branch leaves of these Pacific coast specimens are examined on the inner surface the areolation is peculiar in that the chlorophyll cells, while very wide in their central part, are narrow at their ends, quite corresponding with Warnstorf's figure⁽¹⁾ of *S. pseudocymbifolium* C. M. from the Himalayas of Asia. That this last is specifically distinct from *S. palustre* is, however, questionable in the extreme.

Anyone collecting *Sphagna* in the United States or British America is sure to get *S. palustre* and will want directions for avoiding it rather than the contrary. I can, however, give none. So far as distinction is possible in the field one should learn to distinguish the others of the subgenus and assume that all specimens not strongly characteristic belong to *S. palustre* unless one is collecting in a locality of special interest or is otherwise enabled to collect everything. Its colors are green to brown, it generally grows compactly, may be robust, and fruits rather frequently.

4. *Sphagnum henryense* Warnstorf 1900. This species was discovered by Kearney in the region of Cape Henry, Virginia, from which place it takes its name.⁽²⁾ Its specific value was recognized and well diagnosed by Warnstorf⁽³⁾. The chlorophyll cells of its branch leaves have in section the shape and position of those of *S. palustre*, nor is there much in its external appearance to separate it from that plant. Its chief peculiarity is the condition of the inner walls of the hyaline leaf cells where they overlie the chlorophyll cells, their surface being roughened by a very fine-meshed network of prominent ridges, especially in the lower part of leaf. The fact that this surface is roughened will be noted on microscopic examination of inner leaf surface, also of transverse section of branch leaf, but its exact nature can only be made out, as Warnstorf emphasizes, by longitudinal leaf sections, best secured by sectioning longitudinally one of the short branches of the capitulum. It will then be found to be entirely different from the papillae of *S. papillosum* and more closely resembling the condition of *S. imbricatum*, differing, however, in the fact that the ridges are not nearly so high, so that they do not give the fringe-fibril effect of that species, and that they form a network

(1) Hedwigia 30: pl. xx, fig. g. 1891.

(2) Cf. Contributions U. S. Natl. Herb. 5: no. 6, 510. 1901.

(3) Hedwigia 39: 107. 1900.

with very fine mesh, while those of *S. imbricatum*, though somewhat irregular and often curving in direction, tend to run parallel with rather than cross each other, only occasionally forking. The species shows no other characters suggesting relationship with *S. imbricatum*, but is obviously more closely related to *S. palustre*; the numerous, clearly defined, nearly round pores on the outer surface of the branch-leaves give a distinctive appearance noted also by Warnstorf in the original description. The recognition of this species is one of Warnstorf's most valuable contributions to North American sphagnology. This in spite of the fact that he seems to have forgotten it for a time, for specimens of it collected by Mr. H. H. Bartlett in Georgia received from Warnstorf the herbarium-name *S. Bartlettii*, only to be reduced by him later, according to a letter from Mr. Bartlett, to *S. henryense* as its variety *Bartlettii*. They correspond entirely with his description of the species and form the basis of my knowledge of it, as I have not seen the type. According to Mr. W. R. Maxon, through whose kindness I was enabled to see the types of the species proposed by Warnstorf from Kearney's Dismal Swamp collections, there is no specimen of *S. henryense* in the U. S. National Herbarium, so it is evidently accessible only in Warnstorf's herbarium, now the property of the Berlin Botanical Museum. Other specimens entirely identical collected by Bartlett in the same locality as his *S. Bartlettii* (Branch Swamp, McDuffie Co., Ga.) were wrongly named by Warnstorf, *S. subbicolor* Hampe.

In 1907⁽¹⁾ Warnstorf described *S. alegrense* from Brazil, characterized by the same condition of the cell walls, erroneously stating it to be his first observation of this character in the genus; whether it is really distinct from *S. henryense* I should not undertake to say from the description, though the chlorophyll cells are described as of somewhat different section.

In looking through the material of the New York Botanical Garden, I find one other specimen of our species from Delaware (Laurel, collected by Commons, 1893, No. 65), which leaves its present known distribution Delaware, Virginia, Georgia. It is then one of the species characteristic of our southern Atlantic coast, as for example *S. portoricense*, and may be looked for from New Jersey to Florida. Its organs of fructification as well as its fruit are as yet unknown.

Ithaca, N. Y.

(1) Hedwigia 47: 83, f.

MNIUM FLAGELLARE SULL. AND LESQ. IN NORTH AMERICA

R. S. WILLIAMS

In a small collection of mosses made by Miss Ruth Mylroie on Kodiak Island, Alaska, in 1911 were found some very interesting specimens of a sterile *Mnium* that proved to be *M. flagellare* Sull. & Lesq. The type locality of this species is Hakodadi, Yesso, Japan, where it was collected by Charles Wright in 1855, in connection with the North Pacific Exploring Expedition under John Rodgers, and up to this year it has been known only from Japan and from the region of the Amoor or Sachalin River, including Sachalin Island opposite the river's mouth. The plant takes its specific name from the abundant flagella, 3 or 4 mm. long, that grow out from around and among the antheridia and archegonia of the terminal flower buds. The Alaska specimens show stems, radiculose below, with oblong elliptic, acute, rather distant and long-decurrent leaves, 2 to 2.5 mm. long; leaf border of a double thickness of cells about 2 cells wide and more or less doubly serrate two-thirds down the leaf; costa percurrent, at least in upper leaves and smooth on back; leaf cells, with thin walls, prominently mamillate-papillose on both sides, the median cells about 12μ or rarely 16μ in diameter. Brotherus in Engler & Prantl gives only one other species of *Mnium*, found in China and Japan, having the leaves thus roughened on both sides.

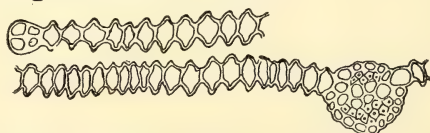


Fig. 1. Cross section through middle of leaf of *Mnium flagellare* $\times 135$.
New York Botanical Garden.

HEDWIGIA ALBICANS (WEB.) LINDB. ON LIMESTONE

H. S. JEWETT, M. D.

Limpricht gives the habitat of this moss as being "on stones and rocks of all kinds (*not, however, on limestone*), exceptionally on roofs." Roth says, "on open-lying as well as shaded stones and rocks, *with the exception of limestone*." (Italics mine.) Husnot, and Dixon and Jameson say "on siliceous rocks," Braithwaite, "on rocks." L. and J. Manual "On rocks — boulders of sandstone and granite."

On Sept. 20, 1911, near Yellow Springs, Ohio, (16 miles N. E. of Dayton,) I found *Hedwigia albicans* (Web.) Lindb. (determination confirmed by Holzinger) flourishing on blocks of limestone (carbonate of lime 85 per cent., carbonate of magnesia 12 per cent.)

Prof. Holzinger writes me "We have the same thing here in S. E. Minn., also on calcareous sandstone."

Truly a cosmopolite—inhabiting nearly every part of the world, and able to adapt itself to the conditions present at each station, if it does not find the soil most congenial to it. Dayton, Ohio.

BRIEF NOTES ON THE DISTRIBUTION OF HEPATICAE

GEORGE H. CONKLIN

I. LOPHOZIA KAURINI (Limpr.) Steph.

Just before the issue of the March (1911) BRYOLOGIST containing the excellent drawings of *Lophozia Kaurini* by Miss Lorenz, a few plants were found in a specimen of *Preissia quadrata* collected at Apostle Islands, Ashland Co., Wisconsin, in May, 1902, by Prof. C. E. Allen of the University of Wisconsin. These plants were determined by Dr. Evans as *Lophozia Kaurini*.

A little later, in examining the material collected by the writer Oct. 3, 1910, at Black River, near Superior, Douglas Co., Wisconsin, good fruiting plants of this beautiful and rare species were again observed. In this instance also, it grew associated with *Preissia quadrata*, on high wet rocks along the side wall of the stream half way up the falls. The plants collected here as well as those from Apostle Islands dry a dark brown, the leaf cells are large, with large trigones, and the leaves show blunt lobes as in the specimens collected by Miss Lorenz. The plants were fruiting and plainly paroicous and the large fully developed barrel-shaped perianth, contracted into a long beak and ciliated at the mouth, is a striking object even under a simple lens.

The leaf cells when dry have a glistening appearance not unlike *Calypogeia Trichomanis*, except that the cell outlines are here dark and brown, instead of yellowish white. A week later while examining Prof. Allen's material from Isle Royale, Lake Superior, collected during the summer of 1901, the writer again found the species, this time mostly in a sterile condition. It would be interesting in view of the later facts concerning *Lophozia badensis*, *Lophozia Kaurini* and *Lophozia Muellieri* to examine all the *Lophozia Muellieri* material in the various herbaria. The writer would also suggest a close scrutiny of all the *Preissia quadrata* specimens, as it is a very commonly associated species.

Apostle Islands are about 75 miles east of Superior, Wis., on the south shore; Isle Royale is about 200 miles northeast on the north shore of Lake Superior. These three localities make a third regional station for *Lophozia Kaurini* for North America, the other two being Yukon and Vermont.

Two allies of *Lophozia Kaurini*, viz.—*Lophozia Muellieri* and *Lophozia heterocolpa* (the *Jungermannia Wattiana* of Gray's Manual)—occur in the Duluth-Superior district. Sterile forms of *Lophozia Kaurini* might easily be mistaken for *Lophozia heterocolpa*, which is very common along all the rocky waterways. The former, however, is a much larger plant. *Lophozia heterocolpa* occupies in size an intermediate position between *Lophozia Kaurini* and the dioicous *Lophozia Muellieri*. It has the same brown color when dry, but is more

dull in appearance. It is readily distinguished by its upright gemmiparous branches, rarely absent, bearing masses of gemmae on large-celled, strangely modified, three ranked leaves. *Lophozia heterocolpa* is also dioicous, although it fruits so rarely that out of hundreds of collections of this plant carefully searched, only one perianth has been found. *Lophozia Kaurini* and *Lophozia Muelleri* fruit freely in this district. II. *LOPHOZIA BAUERIANA* Schiffn.

Dr. Evans has fully described this species in his Notes on New England Hepaticae (Rhodora **10**: 188. 1908). At that time the species had been recorded from Arctic America (Greenland, Ellesmere Land, and North Lincoln) by Bryhn, and from one New England station, at Little Saddleback Mountain, Franklin Co., Maine (Chamberlain and Knowlton). Since then Dr. Evans has received specimens from Cape Caribou, Bic, Rimouski Co., Quebec (J. F. Collins, 5108, July 22, 1907); Pipestone Creek, Atha. (J. Macoun, 57, June 30, 1904); Lake O'Hara, B. C. (J. Macoun, 42, Aug. 10, 1904).

Lately the plant has been sent to the society herbarium, from four other localities so widely separated, that it is evident that the distribution of the species is much more extensive than was formerly supposed. The new stations are:—

Sisson, Cal. (George M. Pendleton);
Glacier National Park, Montana (John M. Holzinger);
Riguad, Quebec (Prof. H. Dupret);
Glacier, B. C. (C. C. Kingman).

The plants in each of these collections show the distinguishing marks of the species, which are as follows:—

The plants are intermediate in size between *Lophozia Floerkei* and *L. lycopodioides*; the underleaves are sparingly ciliated, the lobes of the leaves are often four instead of three, and apiculate instead of blunt as pertains to *L. Floerkei*. The lobes of the leaves often end in a sharp bristle-like point, similar to those of *L. lycopodioides*, but the leaves lack the size, breadth, fluted, crisped, and ciliated condition of the leaves of that species. The plants of *L. Baueriana* are generally freely gemmiparous, unlike most of the other species of the *barbata* group (*Barbilophozia*), to which it belongs. *L. attenuata* (Mart.) Dumort. is of course an exception, but bears its gemmae on upright shoots of closely appressed modified leaves. It is of interest to note that Dr. Karl Müller⁽¹⁾ combines *L. Baueriana* Schiffn; *Jungermannia Hatcheri* Evans, an Antarctic species from Patagonia; *Barbilophozia Hatcheri* (Loeske); and similar plants of other authority, under the name of *Lophozia Hatcheri* (Evans) Stephani. It is by this name that the species will probably be known. It has a wide European distribution, and the collections reported here also show a considerable range for North America.

(1) Rabenhorst's Kryptogamen-Flora, **6**: 631-2.

PRESIDENT'S REPORT

During the past year the president has played but a small part in carrying on the work of the Society, and yet it has been a pleasure to him to observe its continued success and progress. The curators of the herbaria have been zealous in caring for the collections in their charge and have materially increased them through their persistent efforts. At the same time they have made the collections available to the other members of the Society, either by the lending of specimens or by the distribution of duplicate material.

At the beginning of the year Mrs. Annie Morrill Smith, who had so ably acted as editor of the *Bryologist* during the greater part of its existence, felt obliged to retire from active service. The journal was then placed in charge of Dr. A. J. Grout, as editor-in-chief, and a board of associate editors, representing the various interests of the Society, was appointed to assist him. This board consists of Messrs. G. N. Best, A. W. Evans, J. M. Holzinger, and L. W. Riddle, together with the advisory board officers of the Society. Mainly through the efforts of the editor-in-chief the *Bryologist* has been continued as far as possible along the lines instituted by Mrs. Smith, and the fourteenth volume, consisting of 108 pages and including numerous illustrations, has recently been brought to completion.

There is still much work for the members of the Society to do. In the field of the Hepaticae, with which the president is most familiar, many parts of the country are still unexplored, and additional species are continually being detected in regions which have been more thoroughly studied. The conditions are much the same with the mosses, and the lichens have received even less attention than the bryophytes. The careful collection of *all* the species in a given locality is a task which any member can carry on, and it is only by such careful collecting, where the more common species are not neglected, that our knowledge of geographical distribution becomes extended and established on a firm basis.

The president congratulates the Society upon the excellent work which it has already accomplished, and looks forward to the continuation and extension of this work in the future.

ALEXANDER W. EVANS,
New Haven, Conn.

REPORT OF THE CUSTODIAN OF THE MOSS HERBARIUM

When the Moss Herbarium arrived last March from St. Louis where it had been for several years stored at the Botanic Gardens, it contained 1588 mounted native specimens, representing 422 species,

and 110 genera, as well as much loose unclassified material. The Herbarium now contains a grand total of 2197 mounted specimens, of which 1835 specimens representing 493 species and varieties, and 125 genera, are native, and 362 specimens representing 324 species and varieties, and 108 genera, are foreign.

The foreign herbarium which contains the generous contributions of A. Bruce Jackson, Eikichi Iishiba, Shutai Okamura, W. H. Lett, W. E. Nicholson, the late F. Renauld, and W. W. Watts, has been placed in red genus covers and the whole has been classified according to Engler & Prantl.

Many members in the United States have contributed native specimens, and a liberal series from G. M. Pendleton, Sisson, California, is soon to be added to the collection, but a much wider correspondence is desired.

The Department is in possession of abundant and excellent duplicate specimens which only await exchange with those who may wish to simultaneously enrich their own and the Society's herbarium. With the collaboration of all it is sincerely hoped that the ensuing year will bring renewed bryological zest and activity to our members who should bear in mind the herbarium and its needs. Under such conditions the collection cannot fail to grow both in extent and value, while the strength of common interests will aid fraternity among the many members of the Sullivant Moss Society.

GEORGE B. KAISER,
Germantown, Pa.

REPORT OF THE CUSTODIAN OF THE LICHEN HERBARIUM

The Lichen Herbarium contains at present 1454 specimens, representing 58 genera, and 465 species and varieties; 299 specimens have been added this year, 65 of these being new to the herbarium.

Specimens have been sent in for determination from all the New England states, from the Middle Atlantic states, from the Rocky Mountains, from all the Pacific states, and from Canada. We need specimens from the central and southern states very badly. Among the larger contributions during 1911 were a fine lot from Dr. Jewett, collected on an island in Casco Bay, Maine; a large number from Vermont, collected by Messrs. Kirk and Dutton; some interesting specimens from British Columbia, Arizona, and California, collected by Miss Greenwood; Washington and Oregon lichens from Mr. Foster; a generous supply from California, collected by Mr. Kingman; and some Canadian lichens from Mr. Dupret, and Brother Victorin.

Among the foreign contributions may be mentioned:—The Rev. P. G. M. Rhodes has sent lichens from England and Wales, the Rev.

David Lillie from the extreme north of Scotland, and Miss Flockton from Australia, New Zealand, and the Fiji Islands. There were also various smaller contributions from other members. Many yet remain to be studied and named. Prof. Fink, Prof. Riddle, and Mr. R. H. Howe, Jr., very kindly assisted me in the work of determination.

MARY F. MILLER,
Washington, D. C.

REPORT OF THE CUSTODIAN OF THE HEPATIC HERBARIUM

It is a pleasure to note the growing interest of the members in this Department of the Society. 427 specimens, many of them rare, have been added during the year to the Herbarium, making the total number of specimens 2,596.

Chief among these contributions is a collection of 35 named specimens from Japan, given by Prof. Eikichi Iishiba of Sendai. These, with his former gift of 54 packets of Japanese specimens, together with 20 Japanese specimens secured by Prof. F. S. Beattie, (which are in process of determination,) make a notable addition of material from Asia.

Prof. A. S. Foster continues to send the Herbarium western material of great value. 53 specimens of his were added this year. Prof. Sheldon gave 47 packets from West Virginia. Bro. Victorin sent 37 packets from Longueuil P. Q., Canada. Prof. H. Dupret sent collections from Regaud, St. Hilaire and Oka., P. Q., Canada.

George M. Pendleton of Sisson, Cal., Miss Carlotta H. Browne of Philadelphia, Pa., and Miss Helen Greenwood of Worcester, Mass., have added large numbers of specimens from their respective localities. The latter recently sent material collected this year at Yosemite, Cal., and Glacier, B. C. Prof. Holzinger remembered us with duplicates of his species from Montana and New Mexico.

Our three K's—Kingman, Kaiser and Krout, have been most faithful in completing the duplicate lists of their collections in the Herbarium, adding over 70 specimens, besides giving a large number of duplicates for use in securing exchanges. Mr. W. W. Calkins, Mrs. Elizabeth M. Dunham and Rev. S. M. Newman, have also been contributors.

Miss Haynes has added the twenty numbers, 80 to 100, of this year's issue of "American Hepaticae." The Vice President also secured through exchange 20 additional species collected in England and Wales, from Rev. Philip G. M. Rhodes, Kidderminster, England; also a collection made by Mr. C. B. Robinson from Saguenay Co., Quebec, besides giving many valuable specimens and duplicates from her own collections.

The President and Vice President by their prompt and efficient aid continue to inspire a hearty devotion to the service in all associated with this Department.

GEORGE HALL CONKLIN.

REPORT OF THE TREASURER

In submitting the following, attention is called to the item "Loan on Contingency Fund," which appears on both sides of the account, having been paid into the treasury early in the year ; later, when it was seen that the amount taken in would suffice, it was returned. We have to thank Dr. Conklin, who contributed the expenses in connection with the Minneapolis Meeting. The disbursements, however, include an unusual amount, as it was necessary to move the back numbers, etc., and the Moss Hebarium, and allow for its rearrangement on modern lines. As we start this year with a smaller balance on hand, it is urged that an especial effort be made to increase membership in the Society and also general subscriptions.

RECEIPTS

By Cash on hand December 1st, 1910	\$114.85
" " Loan on Contingency Fund	60.00
" " Subscriptions, Dues, Sale of Files and Index	373.60

\$548.45

DISBURSEMENTS

To Treasurer, First Circular Letter	\$ 6.50
" " Second Letter and Bills	6.00
" " S. M. S. Blank Books	2.50
" Dr. Grout, Expressage Files to New Dorp	6.90
" " Bryologist envelopes	7.50
" Agents' Commissions and Bank Fees	7.29
" Mr. Kaiser, Moss Herbarium Supplies	14.23
" Postage and Expressage Bryologist Editions	12.40
" Loan on Contingency Fund	60.00
" Plates and Printing January Bryologist	52.57
" " " " March	54.25
" " " " May	58.15
" " " " July	67.21
" " " " September	57.83
" " " " November	56.34

\$469.67

' Cash on hand December 1st, 1911	78.78
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\$548.45

ANNIE MORRILL SMITH, Brooklyn, N. Y.

SULLIVANT MOSS SOCIETY NOTES

The eighth meeting of the Sullivant Moss Society in affiliation with the American Association for the advancement of Science was held in the Business High School Building, 9th Street and Rhode Island Ave., N. W., Washington, D. C., on Thursday, December 28th, 1911. Cards were sent out to all members giving details and asking for papers and exhibits.

REPORT OF ELECTIONS

For officers of the Sullivant Moss Society for 1912:

Whole number of votes cast	13
For President, Dr. Alexander W. Evans	13
For Vice-President, Miss C. C. Haynes	12
" " " Mr. E. B. Chamberlain	1
For Secretary, Mrs. Eva B. Gadsby	12
" " " Dr. G. H. Conklin	1
For Treasurer, Mrs. Annie Morrill Smith	13

Therefore Dr. Evans, Miss Haynes, Mrs. Gadsby and Mrs. Smith are declared elected.

Respectfully submitted,

EDITH A. WARNER, Judge of Elections.

EXCHANGE DEPARTMENT

Miss Annie Lorenz, 96 Garden St., Hartford, Ct.—*Georgia geniculata* Lindb. Collected in New Hampshire.

Mr. Geo. B. Kaiser, 524 Locust Ave., Germantown, Pa.—*Grimmia Olneyi* Sulliv.

Dr. H. S. Jewett, 15 W. Monument Ave., Dayton, Ohio.—*Tortula Muelleri* Bruch and *Hypnum revolutum* Mitt. forma. Both from Colorado.

Mr. Geo. L. Kirk, 18 E. Washington St., Rutland, Vt.—*Entodon cladorrhizans* (Hedw.) C. M.

LIST SULLIVANT MOSS SOCIETY MEMBERS 1912

* Star indicates Charter Members.

Adam, Mr. F. M., Box 515, Sharon, Mass. M.
 Ames, Mr. Oakes, Ames Botanical Lab., North Easton, Mass. M.
 Andrews, A. LeRoy, Ph. D., 120 Oak Ave., Ithaca, N. Y. M.
 Atwood, Charles, M. D., Moravia, N. Y. M.
 Badè, Wm. F., Ph. D., 2223 Atherton Street, Berkeley, Calif. M.
 Bailey, J. W., M. D., 4541 Fourteenth Ave., N. E., Seattle, Wash. H.
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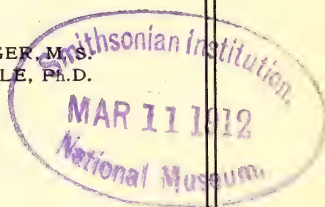
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CONTENTS

✓ A New <i>Frullania</i> from Florida (<i>Illus.</i>) . . .	Alexander W. Evans	22
✓ <i>Leucodontopsis</i> Cardot (<i>Illus.</i>) . . .	Elizabeth G. Britton	26
✓ Notes on the Mosses of Jamaica . . .	Elizabeth G. Britton	28
✓ Further Notes on the North American Distribution of the Genus <i>Usnea</i> . . .	R. Heber Howe, Jr.	29
✓ The Genus <i>Clastobryum</i> in America . . .	R. S. Williams	31
✓ Notes on Mosses Growing Unattached . . .	H. N. Dixon	31
Philippine Bryophytes and Lichens . . .	C. B. Robinson	32
Review-Current Literature . . .	Alexander W. Evans	33
Meeting of the Sullivant Moss Society . . .	Edw. B. Chamberlain	35
Sullivant Moss Society Notes . . .		36
Mosses as a Factor in Land Conservation . . .	A. J. Grout	37
Exchange Department . . .		37



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No. 2

A NEW FRULLANIA FROM FLORIDA

ALEXANDER W. EVANS

During the past few years Mr. Severin Rapp, of Sanford, Florida, has had the kindness to send the writer a large series of Hepaticae for determination. One of the most interesting of these is a *Frullania*, which is evidently undescribed, and it is a pleasure to associate with this distinct species the name of its discoverer. In the writer's Revision of the North American Species of *Frullania*, published in 1897,¹ those occurring in the United States and Canada are the only ones considered. Twenty-two in all are recognized, two being incompletely known. Since the publication of this paper one of the species, *F. virginica* Gottsche, has been declared synonymous with *F. eboracensis* Gottsche,² while another species, *F. saxicola* Aust., has been withdrawn from among the synonyms of *F. eboracensis* and reinstated as a distinct plant.³ The only other addition which has been made to the list is the tropical *F. gibbosa* Nees, which Stephani has recently reported from Alabama.⁴ This and the new species described in the present paper increase the total number to twenty-four. In spite of the fact that *Frullania* is essentially a genus of warm regions, attaining a high degree of development in the tropics of America, only seven species are definitely known from Florida. In addition to the new species these include the following: *F. arietina* Tayl., *F. Donnellii* Aust., *F. eboracensis* Gottsche, *F. Kunzei* Lehm. & Lindenb., *F. obcordata* Lehm. & Lindenb.,⁵ and *F. squarrosa* (R., Bl., & Nees) Dumort.

Frullania Rappii SP. NOV.

Dull green, sometimes more or less tinged with brown or red, irregularly scattered or in very loose tufts; stems prostrate and closely appressed to the substratum, copiously and irregularly branched, the vegetative branches sometimes short and limited in growth but often essentially like the stem, usually with smaller leaves near the base: leaves more or less imbricated, sometimes so densely so that the lobules overlap; lobes slightly convex, not squarrose, widely spreading, ovate, 0.75 mm. long and 0.6 mm. wide when well developed, rounded but not cordate at the dorsal base and arching across the axis, rounded to very obtuse at the apex, entire or vaguely sinuate along the margin, sometimes minutely crenulate at the base; lobules galeate (rarely explanate), distant about 0.06 mm. from the axis and averaging about 0.27×0.24 mm., subparallel with the axis

¹ Trans. Connecticut Acad. 10: 1-39. pl. 1-15. 1897.

² Rhodora 8: 44. 1906.

³ Rhodora 12: 202. 1910.

⁴ Species Hepat. 4: 344. 1910.

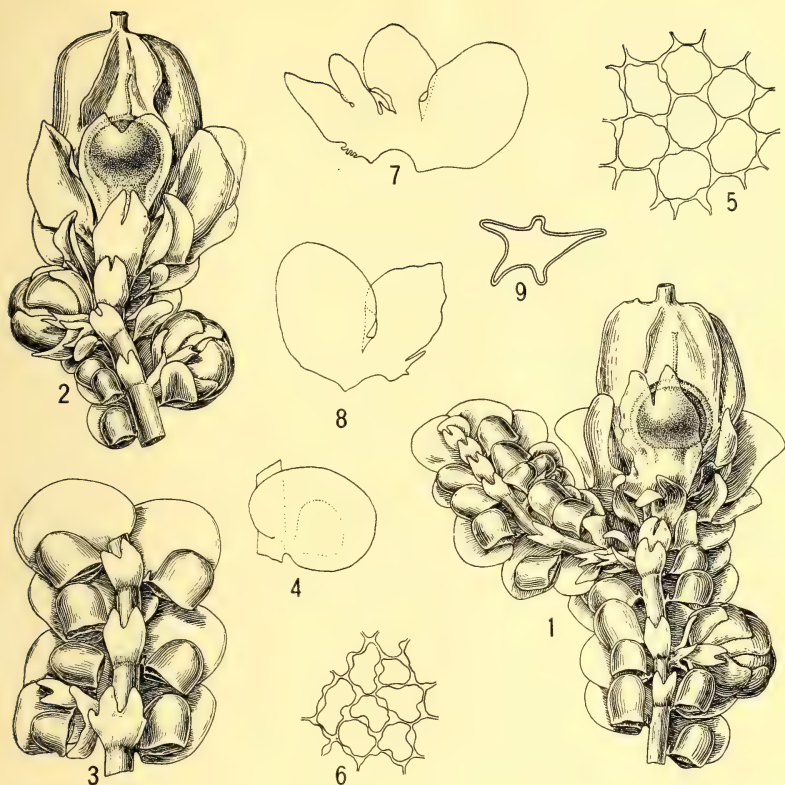
⁵ Includes *F. caroliniana* Sulliv. See Evans, BRYOLOGIST 11: 70. 1908.

or more or less spreading, truncate and compressed at the mouth, otherwise inflated, especially along the keel; stylus minute, subulate; cells of lobe averaging about 14μ along the margin, 16μ in the middle, and 23μ at the base, trigones distinct, triangular with straight or bulging sides, intermediate thickenings very scanty, oval; cells of lobules with numerous intermediate thickenings and irregular cavities: underleaves distant to subimbricated, plane, broadly ovate, 0.3 mm. long and 0.27 mm. wide when well developed (but often much smaller), cuneate at the base, bifid one third to one half with a narrow sinus and broad divisions, rounded to acute at the apex, entire or unidentate on one or both sides: inflorescence autoicous: ♀ inflorescence borne on a more or less elongated axis, usually giving off a branch just below the involucre; bracts in about three pairs, those of the innermost pair complicate, deeply and unequally bifid, the lobe oblong to obovate, about 0.9×0.6 mm., rounded to very bluntly pointed at the apex, entire, lobule ovate, about 0.7×0.45 mm., rounded to obtuse at the apex, bearing close to the base a slender lanceolate stylus, measuring about 0.2×0.06 mm. when well developed; innermost bracteole connate on one side with a bract, oblong-ovate, about 0.7×0.4 mm., bifid about two thirds with a narrow sinus and suberect rounded to acute lobes; perianth about half exserted, about 1 mm. long and 0.75 mm. wide, oblong in outline more or less compressed with sharp lateral keels, rounded to truncate at the apex with a short beak, entire or very minutely crenulate at the mouth, ventral keel broad and sharply two-angled, dorsal keel sharp, about half as long as the perianth, sometimes accompanied by one or two supplementary keels, margins of keels smooth: ♂ inflorescence occupying one or two globoid spikes borne below the involucre (and the subfloral branch); bracts in two or three pairs, closely imbricated, subequally bifid with blunt lobes and an arcuate keel; bracteoles minute and bifid: capsule about 0.4 mm. in diameter; spores averaging 30μ in short diameter, greenish brown, thick-walled, the surface bearing scattered circular spots, each composed of a series of minute radiating ridges; elaters about $220 \times 15\mu$, truncate, with a single reddish spiral. (FIGURES 1-9.)

On trees. Sanford, Florida (S. Rapp, Nos. 18 and 21). No. 18, collected in June, 1911, may be designated the type. The accompanying species are *Leptocolea Jooriana* (Aust.) Evans and *Microlejeunea bullata* (Tayl.) Evans.

The new species belongs to Spruce's subgenus *Trachycolea*, which Stephani¹ has recently renamed *Galeiloba* on account of the fact that many of the species have perfectly smooth perianths. According to published descriptions the female inflorescence in certain members of this subgenus is borne on a short lateral branch, while in others it is borne on the main stem or on a leading branch. In Stephani's opinion, however, the inflorescence is invariably borne on a short branch, and any other interpretation is based on a misconception. According to his account the inflorescence sometimes seems to be terminal on a leading branch, but when this is the case an apparent innovation is always developed below the involucre and this apparent innovation really represents the continuation of the main axis. In the course of development the portion of the shoot bearing the

¹ Species Hepat. 4: 358. 1910.



FRULLANIA RAPPII Evans

FIGS. 1 and 2. Parts of plants, ventral view, showing perianths and antheridial spikes, $\times 27$.

FIG. 3. Part of a stem, ventral view, $\times 27$.

FIG. 4. A leaf, dorsal view, $\times 27$.

FIG. 5. Cells from the middle of a lobe, $\times 300$.

FIG. 6. Cells from a lobule, $\times 300$.

FIGS. 7 and 8. Innermost bracts and bracteole from a single involucre, $\times 27$.

FIG. 9. Transverse section of a perianth in the upper half, $\times 27$.

The figures were all drawn from the type specimen by the writer and prepared for publication by Mr. Stanley C. Ball.

involucre and perianth becomes pushed to one side by the apparent innovation and then shows its true morphological character as a short branch. A careful study of the conditions found in *F. Rappii*, as well as in most of the other North American species of *Trachycolea*, shows that Stephani's ideas cannot be maintained. There are cases, for example, such as the one shown in FIGURE 2, where the female axis bears no branches in the vicinity of the inflorescence except the antheridial spikes. Under these circumstances it would hardly be possible to interpret the portion of the axis bearing the involucre and perianth as a branch of the part below it. But even when the female axis bears what Stephani calls an apparent innovation, as shown in FIGURE 1, this always arises in connection with an elobulate leaf of the axis and clearly represents the missing lobule of this leaf, just as in all ordinary branches throughout the genus *Frullania*. The presence of the elobulate leaf shows, therefore, that the apparent innovation represents a true branch and ought not to be regarded as the direct continuation of the axis. When the involucre and perianth become pushed to one side through the robust development of this branch, the axis formed is a sympodium and not a monopodium as Stephani's explanation would imply. It thus seems to be clear that while the female inflorescence is sometimes borne on a short branch, it may in other cases be borne on a leading branch, as previous writers have maintained. Its position, in fact, seems to be constant for a given species and occasionally affords helpful characters in distinguishing between closely related plants.

The cell structure of *F. Rappii* presents a number of interesting peculiarities with respect to the distribution of the local thickenings in the walls. In the lobes of the leaves, trigones are everywhere apparent and frequently bulge out into the cell cavities (FIG. 5). Intermediate thickenings, on the other hand, are rare and many lobes fail to show them altogether. Even on the bracts, the lobes show very few thickenings of this character. The cells of the lobules of the ordinary leaves differ widely from those of the lobes, intermediate thickenings forming a conspicuous feature of their walls (FIG. 6). On the bracts the lobules are still well provided with these thickenings, although there are fewer than on the ordinary leaves. The cells of the underleaves, bracteoles, and perianths are much like those of the lobules of the bracts. In most of the species of *Trachycolea* which have been heretofore described, the thickenings of the walls are fairly uniform throughout all the appendicular organs. In the usual type of cell, represented by such species as *F. eboracensis* and *F. squarrosa*, both trigones and intermediate thickenings are present in practically all the cells, thus making the contours of the cavities wavy. In the rarer type of cell, represented by *F. inflata* Gottsche, *F. Bolanderi* Aust., and their allies, no intermediate thickenings whatever are present, the local thickenings being restricted to the trigones. In these cells the cavities are polygonal in outline with rounded angles. It will be seen at once that the cell structure in *F. Rappii* is intermediate between these two types.

In comparing *F. Rappii* with other species of *Trachycolea* the Cuban *F. cobrensis* Gottsche¹ will be found to be one of its closest allies. This species was

¹ In Stephani, *Hedwigia* 33: 142. 1894.

found by Wright and distributed without number in his *Hepaticae Cubenses*, but has not since been collected. It agrees with *F. Rappii* in the following peculiarities: the inflorescence is autoicous; the lobes have the same general form; the lobules present the same type of structure and are relatively large, measuring about 0.2×0.18 mm.; the female inflorescence is borne on a leading branch; the bracteole is connate on one side; the perianth shows the same form and a similar distribution of its keels. The Cuban species, however, is distinctly smaller, the lobes of the leaves rarely exceeding a size of 0.4×0.3 mm. It is further distinguished by the presence of a distinct group of enlarged and reddish cells at the base of the lobe, the corresponding cells in *F. Rappii* showing no special differentiation. The stylus in *F. cobrensis* also yields a few differences. On the ordinary leaves, it measures about 0.1×0.04 mm., and is therefore considerably larger than in *F. Rappii*, where it averages about 0.07×0.03 mm. On the perichaetial bracts the difference in size is even more apparent, the stylus in *F. cobrensis* being in the form of a distinct lobe.

In addition to *F. Rappii* no fewer than four autoicous species of *Trachycolea* are known from the United States, the others being *F. inflata*, *F. saxicola* Aust., *F. Oakesiana* Aust., and *F. Catalinae* Evans. The first two of these species have a rather wide distribution and represent southern rather than northern types, the third has a distinctly northern range, while the fourth is known only from California. In all four the cell structure conforms to the second type described above. In many respects *F. inflata* is more closely related to *F. Rappii* than are the other autoicous species. It differs, however, not only in the structure of the cell walls, but also in the size of the cells, which attain a diameter of about 24μ in the middle of the lobe instead of only 16μ . Explanate lobules are likewise of frequent occurrence in *F. inflata*, and the perichaetial bracteoles are free from the bracts. In the very similar *F. saxicola* explanate lobules are still more usual, and the mouth of the perianth is remarkable in being occluded by papillae which grow out from the margin and inner surface.

YALE UNIVERSITY.

LEUCODONTOPSIS CARDOT *

(*Leucodoniopsis* R. & C.)

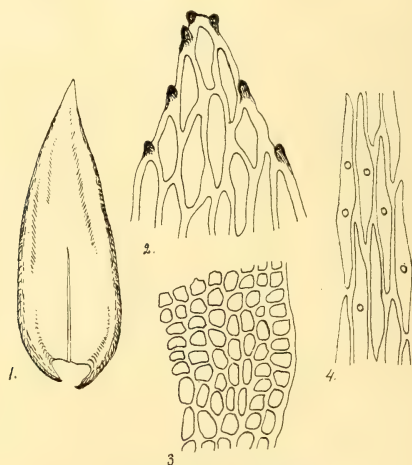
ELIZABETH G. BRITTON

In 1893 this genus was founded on specimens collected in Costa Rica by Tonduz (no. 5616) which were described as *L. plicata* R. & C. and type specimens of which they have kindly shared with me, in exchange for some specimens collected by me in the Bahamas in 1904. In both cases the specimens are sterile, but propagate by septate gemmae, growing in clusters in the axils of the

* P. S. Since writing the above, after notifying M. Cardot and sending him specimens of Dr. Small's no. 3227 from Grassy Key, Florida, he informs me that the spelling should be *Leucodontopsis*, not *Leucodoniopsis*.

leaves, as in *Pirea cymbifolia*. Dr. Small and Mr. Carter also collected it in Andros Island, Bahamas, in 1910, and in hummocks at Grassy Key in subtropical Florida, January 1909. Mr. Williams found abundant and well-grown material at Cana, Panama, in 1908, also sterile. It occurs also in Porto Rico, near Mayaguez, and I have collected it growing on twigs and bushes near Guanabana in the Trinidad Mountains of Santa Clara in Cuba. It appears to be dioicous as these last were archegonial plants.

For many years I have wondered what *Neckera* (*Pilotrichum*?) *floridana* Aust. was, for all the specimens in Austin's Herbarium agree with *Pirea Ludo-*



Leucodoniopsis floridana.

Fig. 1. Stem leaf $\times 20$.

Fig. 2. Apex of leaf $\times 220$.

Fig. 3. A part of alar cells $\times 220$.

Fig. 4. Median cells $\times 220$.

viciae (C. M.) Broth. At last I have seen authentic specimens, collected on trees, near Dr. Kellum's on the Caloosahatchie River, near Caloosa, Florida, by John Donnell Smith and Coe Finch Austin in March, 1878, and to my great surprise, they prove to be identical with *Leucodoniopsis plicata* R. & C. The description in Lesquereux and James' Manual is a translation from Austin's in the Botanical Gazette and evidently they had seen no specimens, for the question mark after (*Pilotrichum*?) was printed as Austin had it and this species evidently has no alliance with that genus, which has bicostate leaves and belongs with the *Hookeriaceae*!

Austin added the following foot-note to the original description:

"Leaves usually with a plica near the margin at the base, or often extending to near the apex; costa very light and usually extending a little way above the middle. Possibly a *Meteorium*."

The following synonymy and distribution brings our knowledge of this species up to date.

Leucodontopsis Floridana (Aust.) E. G. B. COMB. NOV.

Neckera (*Pilotrichum*?) *Floridana* Aust. Bot. Gaz. **4**: 152. 1879.

Leucodontiopsis plicata R. & C. Bull. Soc. Roy. bot. Belg. **32**: (1). 177. 1893.

Pilotrichella floridana R. & C. Rev. Bryol. **19**: 11. 1893.

Type locality: Caloosa, Florida.

Distribution: Grassy Key, Florida, J. K. Small 1909, no. 3227. Andros and New Providence, Bahamas; Cuba, Porto Rico and Costa Rica.

Illustrations: None, but very closely resembling Fig. 364 of *L. Camerooniae* (Broth.) Broth. in E. & P. Pflanzenfam. fasc. **223**: 753. 1905, but differing in the longer more acuminate apex and the costa more clearly developed.

Until the fruit is found, the position of this genus will remain somewhat problematical, though by its leaf structure and habit it appears to be correctly placed in the *Leucodontaceae* on account of the differentiation of the marginal basal cells.

NEW YORK BOTANICAL GARDEN, November, 1911

NOTES ON THE MOSSES OF JAMAICA

ELIZABETH G. BRITTON

Olof Swartz in his Prodomus of the Flora of the West Indies, published in 1788, gave brief descriptions of 41 species of mosses, 37 of which were from Jamaica, and 4 from "Hispaniola," portions of which he sent to J. Hedwig for illustration, and 38 of these have been figured correctly either in the 3rd and 4th volumes of the Descriptiones or in the Species Muscorum, in all cases from original specimens collected by Swartz, so that they have become fairly well and accurately known, under their original specific names. Having made six trips to Jamaica since 1896, I have become somewhat familiar with the distribution of the mosses of that island, so that it has been easy to determine the probable type stations for Swartz' Jamaican species, though no localities are mentioned in the original descriptions or recorded with his specimens.

In his Symbolae ad Bryologicus Jamaicaense,* Dr. Karl Müller has redescribed, under new names, some of these old species from collections made by Mr. William Harris, principally in the Blue Mountains since 1896, in several cases, probably, from the same stations where they were collected by Swartz. My reasons for this statement are, that the trails are few, they follow the easiest grades, have been long established and lead through the mountains from the south to the north coast through the lowest passes. It is in these passes or "Gaps" as they are called, that a wealth of mosses may be found, as the cool currents of air blow through laden with moisture borne by the northeast trade-winds. Morce's Gap, Portland Gap and Cuna-Cuna Gap have been highways for centuries and are still delightful collecting grounds for ferns, mosses and

*Bull. Herb. Boiss. Vol. V. No 7. July 1897.

hepatics. Here are the type stations for certain of the rarer species, which occur nowhere else on the Island. Here too, some of the commoner species grow in abundance and in a variety of habitats and show considerable variation in consequence, as the following synonyms show:

PILOTRICHELLA FLEXILIS (Sw.) Jaeg. Adumb. 162. 1875-76.

Hypnum flexile Sw. Prod. fl. Ind. occ. 140. 1788.

Leskea flexilis Hedw. Spec. Musc. 234 t. 58. 1801.

Meteorium flexilis Mitt. Musci Austro am. 438. 1869.

Neckera cochlearifolia C. M. Syn. Musc. 2: 130. 1851.

Neckera turgescens C. M. Syn. Musc. 2: 131. 1851.

Pilotrichella eroso-mucronata C. M. Bull. Hb. Boiss. 5: 563. 1897.

Pilotrichella recurvo-mucronata C. M. Bull. Hb. Boiss. 5: 563. 1897.

Type locality: Jamaica.

Habitat: Common, pendent from branches of trees or creeping up stems of bushes, rare in fruit.

Distribution: W. I.: Jamaica, Cuba, Haiti, Porto Rico, Guadeloupe; C. A.: Mexico, Panama and Taboga, Guatemala, Nicaragua, Costa Rica; S. A.: Brazil, New Granada, Quito and Bolivia.

Mr. Williams and I have arrived at the following conclusions: that the smallest and most depauperate form of the species occurs in Mexico and has been called *P. cochlearifolia* (C. M.) Besch., and the stoutest and most robust form occurs in Jamaica and Mexico and Quito and New Granada and was described as *Neckera turgescens* and *P. flexilis* var. *robusta*. Of the last two of Müller's names published in 1897, *P. eroso-mucronata* is from the type regions of *P. flexilis* and the other *P. recurvo-mucronata* is not specifically distinct. Monsieur Cardot has arrived at only part of the truth when he states* that he cannot separate *P. turgescens* from *flexilis* var. *robusta* Broth. and *P. recurvo-mucronata* (C. M.)

NEW YORK BOTANICAL GARDEN.

FURTHER NOTES ON THE NORTH AMERICAN DISTRIBUTION OF THE GENUS USNEA

R. HEBER HOWE, JR.

Since the publication (Bull. Torr. Bot. Club, 37: 1-18. 1910) of my paper on the genus *Usnea*, certain specimens have come before me, some of which I was unable to see before, and others in recently published exsiccati. It seems worth while to publish, therefore, these additional notes, and bring in this way my former paper up to date.

Usnea florida (L.) Web. Mr. G. K. Merrill has distributed in his Lichenes Exsiccati No. 133 material collected at Sanford, Florida, which he calls "intermediate with the forma *strigosa* Ach." In my paper on page 4, I included this variety under the contingent phase (d), with the remark; "This phase is most

*Rev. Bryol. 38: 102. 1911.

common in Mexico and Arizona plants." On the basis of Mr. Merrill's material, and of specimens in my own herbarium (Nos. 886, 888) from Jacksonville it would be well to include Florida in this statement, though Mr. Merrill's remark "intermediate" well describes the Florida specimens as they are certainly atypical of the true tropical variety.

Usnea plicata (L.) Web. In the same Exsiccati No. 64, Mr. Merrill distributed material from Matinicus Island, Maine, under the synonym *Usnea ceratina* Ach., and later, No. 130, he distributed material from the same locality under a new form *subplicata*. This form was given no diagnosis, and the name must be relegated to the already overburdened synonymy.

I am recording in the Bull. Torr. Bot. Club, **38**: 292. 1911, the northern "dwarf condition" of this species which has been known as *Usnea barbata* var. *plicata* Fr., from the Yukon. Mr. Merrill in his Exsiccati No. 109 distributes the variety as understood by Tuckerman under the name *Usnea plicata* Ach. from Jamaica. The small specimen that I have examined of the distribution seems to me, however, more probably referable to the *trichodea* (subnaked apothecial) group, though it is slightly papillate, and in Acharius' *Usnea jamaicensis* he calls the apothecia "ambitu nudo." *Usnea jamaicensis* Ach. may prove to be the proper name. It is certainly not the boreal, dwarf *plicata* (L.) Web. referred to by Tuckerman as the variety *plicata* of Fries.

Usnea articulata (L.) Hoffm. Dr. A. C. Herre did not include this species in his first (1906) list of the lichens of Santa Cruz, Cal., but in the more complete work of 1910 (Proc. Wash. Acad. Sci. **12**: 225. 1910) he lists it as a "not very abundant plant on the mountain forests." I have a fragment of one of his plants collected at Castle Rock Ridge, Santa Cruz (2,500 ft.) which though atypical is referable to this species. Its range should now include California, and probably Oregon and Washington, north to British Columbia.

Usnea cavernosa Tuck. In a recent examination of the *Alectoria* material in the herbarium of the Canadian Geological Survey kindly sent me by Prof. John Macoun, I found a specimen of this species from Frazer Falls, Murray river, Quebec, collected Aug. 11, 1905.

In Flora **71**: 81. 1888, Arnold also included this species from Miquelon Island, Newfoundland, under the synonym *microcarpa* Arn.

Usnea angulata Ach. In my former paper I gave the northern range of this species as "about the 43rd parallel" not including the record from Lake Superior, Quebec and Ontario given in Prof. Macoun's Canadian Plants (**61**: 1902), as I was not able to see the material on which the record was based. The three specimens have been recently sent me by Prof. Macoun, and are typical examples of *Usnea longissima* Ach., which leaves the range of the distinctly Austral *angulata* unchanged.

During the past winter I collected atypical specimens of this species in a cedar swamp at Fitzwilliam, N. H., which is just south of the 43rd parallel.

THOREAU MUSEUM, Concord, Mass.

THE GENUS *CLASTOBRYUM* DOZ. AND MOLK. IN AMERICA

R. S. WILLIAMS

This genus, of some 5 or 6 known species, was described in 1854, being based in *C. Indicum* from Borneo. At present one species is known from Borneo and Java, 3 or 4 from India and one from America, where it was first recognized by M. Cardot among Pringle's Mexican mosses (*Clastobryum Americanum* Card., Pringle (*No. 15,640*) Honey Station, Mex., *Revue Bryologique*, 37: 5. 1910). Some undetermined sterile specimens among my Bolivian mosses, collected in 1902 (*No. 2,128*) that I was unable to refer to any known American genus, evidently are the same as the Mexican *Clastobryum*; also specimens collected by Mrs. Britton in the Blue mountains of Jamaica (*No. 1,144*), from near the summit of Sir John Peak, 1908, I believe should be referred to this species, although M. Cardot, *in litt.*, rather seems to think differently. The American specimens are evidently quite distinct from those of the Old World, but among themselves, although from rather widely separated localities, they differ scarcely at all, unless perhaps in the width of leaf and length of leaf point, both variable characters, even in the same plant. In all three collections, the leaves, about 1.5 mm. long, are ovate-lanceolate to very narrowly lanceolate, smooth on both sides, rather distant on the stems, not decurrent, serrulate at apex and more or less recurved on borders below; the median cells are about 4μ wide by up to 40μ or more long, the basal cells brownish, the alar forming distinct brown clusters. Propagulae occur in conspicuous, dense, brown clusters mostly at the apex of the older stems, less often in the axils of the upper leaves; they are about 0.6 mm. long, slender, with numerous cross-walls and greatest diameter (about 40μ) about $\frac{3}{4}$ up from base, from which point they taper more or less in both directions.

NEW YORK BOTANICAL GARDEN.

NOTE ON MOSSES GROWING UNATTACHED

H. N. DIXON, M. A., F. L. L. S.

The following notes may be interesting as supplementing Mr. Burrell's article on *Leucobryum glaucum* (*Bryologist*, 10: 108). I have recently received specimens of *L. glaucum* similar to those described, from Fawley, near Southampton, from Rev. W. L. W. Eyre; Fawley is in the New Forest area, and the "balls," which are lenticular in form and exceedingly compact and regular in structure, are locally known as "Fawley buns." This local name is an interesting evidence of their frequent and striking occurrence.

Mr. Burrell suggests the scratching of game birds such as pheasants as the probable primary cause of disturbance which leads to the detachment of the tufts. This suggestion is supported in a rather interesting way from another quarter. I have recently received from Rev. C. H. Binstead specimens of the New Zealand moss, *Echinodium hispidum* (H. f. and W.) Jaeg., collected by Mr. T. W. Naylor Beckett, one of them annotated by Mr. Beckett thus: "Damp

forests, Waimate, Canterbury, N. Z., 1898, growing unattached. Scratched up by the native wood hen, 'Weka.'" On a further specimen, Mr. Beckett has written—"Growing in quantities, not attached to anything; probably scratched up by the Wekas, and in the damp atmosphere continuing to grow and assuming a bushy habit."

The *Echinodium* is of a loose, straggling habit, and the specimens are more of the nature of the *Porotrichum alopecurum* referred to in the above cited article than of the densely growing *Leucobryum*.

PHILIPPINE BRYOPHYTES AND LICHENS

[Presented at S. M. S. Meeting, Washington, D. C., December 28, 1911.]

C. B. ROBINSON

In response to a request for a brief statement as to the flora of the Philippines, so far as it is of interest to the readers of the *Bryologist*, the following may give some indication of the present state of our information.

Before the time of the American occupation, comparatively few collections had been made in these groups, and these chiefly as side lines of investigation by persons primarily interested in other things. Indeed, almost all of these were obtained by the orchid collectors, Wallis and Micholitz, and by Semper, a zoölogist. Moreover, this state of affairs has partially continued. Among recent collectors, there have been those who found their greatest interest in mosses or hepatics, but unfortunately little has been published upon their work. The great bulk of additions to our knowledge has come from the collections of members of the Bureau of Science, and of its predecessor, the Bureau of Government Laboratories, some of the members of the Forestry Bureau, including Mr. A. D. E. Elmer, and Mrs. Mary Strong Clemens, and every one of these is interested in these plants as constituents of the Philippine flora rather than for their own sake.

In Paris' *Index Bryologicus*, there were credited to the Philippines, 54 genera and 116 species of mosses; in *Die Natürlichen Pflanzenfamilien*, which toward the end includes some of the results of recent work, 66 genera and 139 species. The mosses of all recent collections, both those belonging to the Bureau of Science and those of Mr. Elmer, who has kindly permitted me to examine his lists, have been sent to Dr. V. F. Brotherus, and as a result of his determinations, we now know 148 genera and 448 species. The hepatics, determined by Dr. F. Stephani, show 65 genera and 331 species. The results regarding the lichens have reached us in small part only, but at least 11 new species have been described, and the collections themselves are equally numerous with those of the other groups. In addition, a large quantity of material in all of these has recently been obtained, which will doubtless add still further to the list of species. The numbers would alone prevent an enumeration in this article of these species or even genera, but it is hoped that in the near future lists carefully prepared by specialists will appear in the *Philippine Journal of Science*.

The explanation of the great increase in the number of known species is simple. The country near the settled towns of the Philippines, being usually low land and under cultivation, is poor collecting ground. Around Manila, for example, but few mosses, lichens, or hepatics, could be obtained, and these of comparatively little interest. But the settled conditions in such regions as northern Luzon, and the greater propensity among recent botanists for climbing mountains, have been responsible for most of the additions, as in ravines and especially at high levels, a bryologist reaps a rich harvest.

The general problems give very much the same results as with flowering plants, the flora being preponderatingly Malayan. A much smaller number of species have distinctly northern affinities, still fewer are Australian, being known only from the Philippines and that continent and regions still more remote. There are quite a number as yet known only from the Himalayan region and these Islands. Among the hepatics, several seem to have Polynesian affinities.

There is again, as with flowering plants, a high proportion of endemic species, with a very few endemic genera. To illustrate, the second last list of determinations of hepatics indicated 24 new species, the last of mosses 21, although both also added largely to the number previously known from other countries, but not from the Philippines. On the other hand, the last list of hepatics, while adding one genus and 25 species to our known flora, does not specify a single one as new. It is in every way probable that the totals given above will ultimately be very greatly increased.

BUREAU OF SCIENCE, Manila, P. I.

Review

Müller, K. Die Lebermoose Deutschlands, Oesterreichs und der Schweiz. I. Abteilung. Rabenhorst's Kryptogamen-Flora, zweite Auflage, Band VI. Leipzig (Eduard Kummer), 1906-1911. 870 pages, with 363 text-figures.

Dr. Müller's treatment of the liverworts of Germany, Austria, and Switzerland is one of the most important works on European Hepaticæ which have been published during recent years. It is by no means a local flora, as the title would perhaps imply. All the European species are considered, although those known to occur within the assigned limits are more fully discussed than the others. The author even includes a few species from Africa, Asia, and arctic America with the idea that they may yet be found in Europe. The sequence followed is essentially that of Schiffner in Engler & Prantl's "Die natürlichen Pflanzenfamilien." The present volume includes the Ricciaceæ, the Marchantiaceæ, the Jungermanniaceæ anakrogynæ, and the group Epigonanthæ of the Jungermanniaceæ akrogynæ. The remaining groups of this last family, together with the Anthocerotaceæ, are reserved for a second volume.

Although, as the introduction states, the character of the work is largely taxonomic, the other aspects of the subject are by no means neglected. Preced-

ing the purely descriptive portions of the volume and occupying the first 137 pages is a series of chapters dealing with the relationships of the Hepaticæ to other plants, the general characteristics of the group, their structure, their biology, and the various systems of classification which have been proposed. The descriptions are unusually full and clear, and keys for the determination of specimens are everywhere inserted. Practically every species occurring within the assigned limits of the work is figured in more or less detail, and the majority of the illustrations are from original drawings, either by the author himself or by P. Janzen.

When the great similarity between the hepatic flora of Europe and that of North America is remembered, it will be seen at once that the present publication is of the utmost importance to students on this side of the Atlantic. The first volume includes descriptions of nearly 250 species; considerably more than half of these are already known from North America, and it is probable that a good many of the others still await discovery.

The genera recognized and the names applied to them are for the most part familiar to American students. It should be noted, however, that the generic names of S. F. Gray are not accepted, *Pallavicinia* appearing as *Blyttia* and *Moerckia*, *Riccardia* as *Aneura*, *Nardia* as *Alicularia* and *Eucalyx*, and *Myliä* as *Leptoscyphus*. One generic name which is open to criticism is *Haplozia*, in spite of the fact that many other writers are showing a tendency to use it. As defined by the author *Haplozia* is essentially the equivalent of *Jungermannia*, as restricted by Howe in his "Hepaticæ and Anthocerotæ of California." The name is due to Dumortier who, however, spelled it "*Aplozia*." He originally applied it in his "Sylloge Jungermannidearum" of 1831 to a subgenus under *Jungermannia*, and it was not formally published as a genus until 1874, when he issued his "Hepaticæ Europæ." In its subgeneric sense *Aplozia* contained fifteen species, which recent writers distribute among the genera *Myliä*, *Jame-soniella*, *Jungermannia*, and *Nardia*. In its original generic sense it contained twenty-three representatives of the same genera and also two members of the genus *Southbya*. It is evident, therefore, that *Aplozia* cannot be recognized as a modern genus without extensive restrictions and emendations, and the difficulty is increased by the fact that Dumortier indicated no definite species as a generic type. Meanwhile, in 1845, Nees von Esenbeck published in the "Synopsis Hepaticarum" the monotypic genus *Liochlaena*, based on *Jungermannia lanceolata*, a species which Dumortier and all subsequent writers who accept *Aplozia* include under this genus. According to the Vienna Rules, *Liochlaena* has a distinct right of priority over *Aplozia* and ought to be adopted if authors agree that *Jungermannia* must be given up altogether as a generic name.

With respect to the definition of species Dr. Müller occupies a somewhat conservative position. Although he recognizes a large proportion of the species accepted by Lindberg, Schiffner, and other writers, he looks upon many of them as mere variations, due to unusual external conditions. Such species he either reduces directly to synonymy or describes as varieties or forms. He is further careful to distinguish undoubted species from those which he designates "kleine Arten," which expresses about the same meaning as the "elementary species"

of De Vries. A "kleine Art" is closely allied to some other species, differing from it in a very few particulars, while an undoubted species has more numerous and more definite points of distinction when contrasted with its relatives. For example, in the genus *Lophozia*, *L. porphyroleuca* (Nees) Schiffn. is described as a variety of *L. ventricosa* (Dicks.) Dumort., *L. longiflora* (Nees) Schiffn. is given as a "kleine Art" to be segregated from *L. ventricosa*, while such a species as *L. excisa* (Dicks.) Dumort. is regarded as undoubtedly distinct from *L. ventricosa*. Of course the conception of a species is largely subjective, and it must be admitted that the views advanced are based on definite principles, even if some of them can hardly meet with unqualified acceptance.

It is a pleasure to recommend Dr. Müller's book to students of the Hepaticæ. It is based on a first hand knowledge of the group, it gives evidence of prolonged and painstaking study, and the conclusions reached in doubtful cases are the result of sound and critical judgment.

ALEXANDER W. EVANS

[The work may be ordered from Eduard Kummer, Leipzig, Germany, at 33 Marks, 60 Pf.]

MEETING OF THE SULLIVANT MOSS SOCIETY

The eighth annual meeting of the Sullivant Moss Society was held in the Business High School building at Washington, D. C., on December 28th, in connection with the yearly meeting of the American Association for the Advancement of Science.

The forenoon was devoted to arranging the various exhibits, and to a renewal of acquaintanceships, while the regular programme of papers was held in the afternoon. The following is a list of the various exhibits.

Miss C. C. Haynes and Mrs. Smith sent advance sheets of a check-list of the Hepatics of North America, soon to be issued by them. Mrs. Smith also sent a number of drawings, plates, and other articles illustrative of the work of the "BRYOLOGIST." Mr. George B. Kaiser and Mrs. Gadsby showed an extensive series of specimens, each mounted on a separate card and enclosed in a cover, designed to facilitate either exhibition or reference without damage to the specimen. Many of the specimens were accompanied by colored drawings, showing dissections of the various species.

Miss Carlotta H. Browne exhibited specimens of different species of the *Bartramiaceae*, illustrative of her paper on the genus *Bartramia*, and Mr. A. S. Foster contributed a suite of lichen specimens to accompany his article upon the *Stictae* of the Pacific Coast. Miss Lorenz also kindly forwarded a book containing original drawings of the various species of New England Hepatics, comprising a nearly complete representation of the species of that region. (158 of the 165 species.)

The formal programme opened at half past two o'clock, Dr. A. W. Evans presiding, and the following papers were presented.

1. The Biological Relations of Certain Lower Fungi, Prof. Bruce Fink.
2. A New *Frullania* from Florida, Dr. A. W. Evans.

3. Notes on the Polytricha, Prof. J. F. Collins.
4. Further Notes on Connecticut Mosses, Dr. G. E. Nichols.
5. Thomas Drummond: An Early American Collector, Mr. Edward B. Chamberlain.
6. The BRYOLOGIST, Dr. A. J. Grout.
7. Philippine Bryophytes and Lichens, Mr. C. B. Robinson.
8. A History of Bartramia, Miss C. H. Browne.
9. Leucodontopsis in Florida, Mrs. E. G. Britton.
10. Review of Loeske's "Studies in Comparative Morphology and Philogenetic System of the Mosses, Prof. J. M. Holzinger.
11. On the Occurrence of the Genus *Claopodium* in Europe, Mr. W. E. Nicholson.

12. Abnormality in Moss Leaves, Mr. H. N. Dixon.

13. The Stictae of the Northwest Coast, Mr. A. S. Foster.

The papers by Dr. Evans and Mr. Dixon were illustrated by line drawings. Miss Browne showed several interesting lantern slides in connection with the paper on *Bartramia*, while Prof. Collins accompanied his remarks by blackboard sketches of diagnostic features of the species mentioned.

Owing to the lateness of the hour, it became necessary to close the meeting before the conclusion of the programme, and several papers could be read by title only. It is suggested that in the future, to avoid this trouble, arrangements be made to begin the meetings in the forenoon. Furthermore, if exhibits could be in place on the day when the general meetings of the American Association open, so as to be accessible to visitors from other sections of the Association, much inexpensive and advantageous advertising of the work of the Society could be done.

EDWARD B. CHAMBERLAIN, Acting Secretary.

SULLIVANT MOSS SOCIETY NOTES

One hundred and sixty-seven names are listed in the January BRYOLOGIST. Of these, the following six have resigned during the two months: Mr. Harvey Bassler, Miss C. M. Carr, Miss Emily L. Crosswell, Prof. E. R. Lake, Miss E. W. Rondthaler and Miss Wight.

Five new names are to be added: Rev. John Davis, 318 North 7th Street, Hannibal, Missouri, M. H.; Mr. H. H. Knight, The Lodge, All Saints Villas, Cheltenham, England, M. H.; Rev. A. E. Lehman, Scottdale, Pa., M. H. L.; Mrs. M. B. Streeter, 113 Hooper Street, Brooklyn, N. Y., M.; Dr. F. Cavers, Pharmaceutical Society, Bloomsbury Square, London, W. C., England, M. H.

The bills have been sent out earlier in the year than usual owing to the fact that the amount of dues was inadvertently omitted from the cover of the January BRYOLOGIST. Dues are \$1.50 in United States, while all foreign countries, including Canada, require \$1.60. Ten cents extra for exchange on checks.

MOSES AS A FACTOR IN LAND CONSERVATION

A. J. GROUT

It has long been recognized that the mosses, particularly the *Sphagna*, play an important part in holding back the rainfall in forested regions, thus preventing floods and droughts. Indeed the mosses and the humus that collects in and around their continually growing and continually dying stems is the one most important factor in this work, the trees serving principally to protect and shade the mosses.

Little, if any, attention has been paid to the work of mosses in preventing and delaying erosion, though the author believes that investigation will show that this is no mean factor in the problem.

In the North Carolina mountains where the terrific downpour of the summer showers approaches the New England "cloudburst" in intensity every few days, one will find little peaks and plateaus on a freshly eroded bank that will remind him of a chip on a snowbank in spring. On examination the top of the elevation will be found to be covered with a fine network of moss protonema, which has protected the soil beneath from the rain in the same way that the chip protected the snow from the spring sun. Again, in all the mountain brooks the beds are covered with a more or less extensive mat of aquatic mosses except in the swiftest places. *Hygrohypnum*, *Brachythecium*, and *Amblystegium* in numerous species clothe stones and soil along the bed and banks of the stream, all densely packed with sand and soil rescued from the hurrying waters in their mad spring rush, so that not only is the bed of the stream not eroded by the rushing water, but is even built up by it.

EXCHANGE DEPARTMENT

(To Society Members Only—For Postage.)

Frank Dobbin, Shushan, New York.—*Tetraplodon australis* Sulliv. and Lesq. Collected at North Brookfield, Mass.

Mr. Edward B. Chamberlain, 38 West 59th St., New York City.—*Philonotis fontana* (L.) Brid. c. fr. *Philonotis tomentella* Mol. st. Sent from Finland by V. F. Brotherus.

Mr. George B. Kaiser, 524 Locust Ave., Germantown, Pa.—*Plagiothecium striatellum* (Brid.) Lindb. c. fr. Collected in Philadelphia, Pa. *Hygrohypnum dilatatum* (Wils.) Loeske; *Alisa californica* Sulliv. Collected in Washington by A. S. Foster.

Mr. E. J. Winslow, Auburndale, Mass.—*Paludella squarrosa* (L.) Brid. Collected in Vermont.

Judge W. W. Calkins, Berwyn, Ill.—A number of marine algae mounted—some named.

C. C. Kingman, 11 Lowell St., Reading, Mass.—*Frullania Bolanderi* Aust., *Asterella Palmeri* (Aust.) Und. Collected in southern California.

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D. LEWIS DUTTON, Brandon, Vermont.

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W. W. CALKINS, Berwyn, Ill.

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Vasey's Grasses of the Pacific Slope (Pts. I and II, Bull. No. 13, U. S. Dept. Agriculture)	3.75
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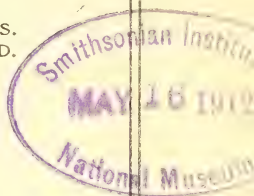
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CONTENTS

Abnormality in Moss Leaves (<i>Illus.</i>)	H. N. Dixon	38
Mosses Common to North America and Japan	E. Iishiba	39
The Genus <i>Claopodium</i> in Europe	William E. Nicholson	41
Notes on <i>Lepidozia</i> Setacea	E. J. Hill	44
Additions to the Lichen Flora of Southern California, No. 7	H. E. Hasse	45
Reviews		48
New North American Mosses by Cardot	A. J. Grout	51
Exchange Department		53
Notes		53

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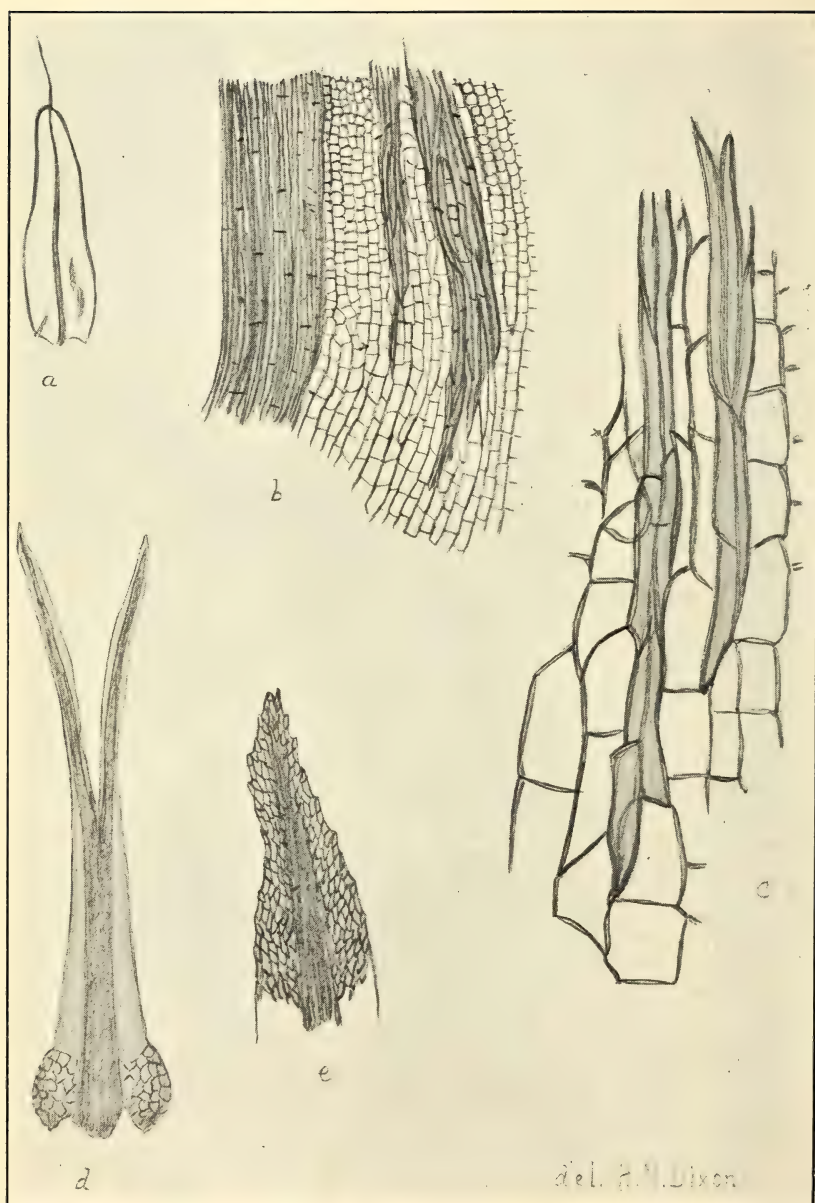


PLATE I

THE BRYOLOGIST

VOL. XV

MAY 1912

No. 3

ABNORMALITY IN MOSS LEAVES

H. N. DIXON, M. A., F. L. S.

Two cases of abnormality in the leaves of mosses, which have come under my notice of late, are described in this note.

The first is a bifid leaf of *Campylopus flexuosus*. This has no doubt been produced by an accidental injury to or interference with the growing point of the leaf. That it arose at a very early stage in the development of the leaf is evident from the fact that it is not simply a bifurcation of the nerve after the leaf had developed its normal tissues. In that case there would be no development of the lamina between the forkings, but only on the exterior sides of the nerve. As a matter of fact the lamina extends down each side of both branches, reaching internally almost to the point of bifurcation. The two halves are approximately equal, so that it appears to be actually a case of forking, not of an outgrowth or branching from the nerve.

Somewhat similar results have been obtained artificially in the leaves of mosses, e. g. *Mnium* (cf. V. Schoenau, Zur Verzweigung der Laubmoose; Hedwigia 51: Heft ½. 1911).

The second is, I think, a much more unusual and less easily explained structure. It occurs in a leaf of *Tortula muralis*, gathered near Northampton, and consists of a transformation of tissue in such a way as to form a structure comparable to a fragmentary adventitious nerve. In the middle of one side of the lamina, a little above the base, a certain number of the normal quadrate-hexagonal and rectangular, parenchymatous cells have been replaced by long narrow, mostly prosenchymatous cells, of a very similar nature to those of which the true nerve is composed, being elongate, of a deep brown color, more or less stereid, and without chlorophyll. Whether they form more than a single layer it is not quite easy to determine (the leaf forms part of a permanent microscopic mount), but in all probability at certain points they constitute at least a double layer. The opposite half of the leaf lamina is quite normal.

The accompanying figures will give some idea of the structure, FIG. *c* showing how at the base of the "adventitious nerve" the abnormal cells pass into the normal parenchymatous tissue.

I am unable to suggest any cause for the origin of this structure.

NORTHAMPTON, ENGLAND.

Explanation of PLATE I. *a*. Leaf of *Tortula muralis* with fragmentary adventitious nerve. *b*. Portion of the same highly magnified. *c*. A portion of the same showing how the normal cells pass over into the abnormal. *d*. Bifid leaf of *Campylopus flexuosus*. *e*. One of the twin apices magnified.

The March BRYOLOGIST was issued March 9, 1912.

MOSES COMMON TO NORTH AMERICA AND JAPAN

BY E. IISHIBA. EDITED BY JOHN M. HOLZINGER

Japan and North America face each other, separated by the Pacific Ocean. As they are in the same latitude, there are many resemblances in weather and climate. And, as a natural result, many of the same species of plants, especially mosses, are found in both countries. The following is a list of such mosses:

- | | |
|--|---|
| <i>Acrocladium cuspidatum</i> (L.) Lindb. | <i>Bryum argenteum</i> L. |
| <i>Amblystegium riparium</i> (L.) Bry. Eur. | <i>Bryum caespitium</i> L. |
| <i>Amblystegium serpens</i> (L.) Bry. Eur. | <i>Bryum capillare</i> L. |
| <i>Amphidium lapponicum</i> (Hedw.) Sch. | <i>Bryum inclinatum</i> (Sw.) Bry. Eur. |
| <i>Andreaea petrophila</i> Ehrh. | <i>Bryum pallens</i> Sw. |
| <i>Anomodon apiculatus</i> Bry. Eur. | <i>Bryum pallescens</i> Schleich. |
| <i>Anomodon attenuatus</i> (Schreb.) Hüb. | <i>Bryum pendulum</i> (Hsch.) Sch. |
| <i>Anomodon minor</i> (P. B.) Fuern. | <i>Bryum pseudotriquetrum</i> (Hedw.) |
| <i>Anomodon rostratus</i> (Hedw.) Sch. | Schwaegr. |
| <i>Aulacomnium heterostichum</i> (Hedw.) | <i>Bryum torquescens</i> Bruch. |
| Bry. Eur. | <i>Buxbaumia aphylla</i> L. |
| <i>Aulacomnium palustre</i> (L.) Schwaegr. | <i>Campylium chrysophyllum</i> (Brid.) |
| <i>Aulacomnium turgidum</i> (Wahlenb.) | Bryhn. |
| Schwaegr. | <i>Campylium polygamum</i> (Bry. Eur.) |
| <i>Astomum crispum</i> (Hedw.) Hpe. | Bryhn. |
| <i>Barbula convoluta</i> Hedw. | <i>Catharinaea angustata</i> Brid. |
| <i>Barbula unguiculata</i> (Huds.) Hedw. | <i>Catharinaea undulata</i> (L.) P. B. |
| <i>Bartramia pomiformis</i> (L. ex. p.) | <i>Ceratodon purpureus</i> (L.) Brid. |
| Hedw. | <i>Climacium dendroides</i> (Dill., L.) W. et |
| <i>Brachythecium collinum</i> (Schleich.) Bry. | M. |
| Eur. | <i>Cratoneuron commutatum</i> (Hedw.) |
| <i>Brachythecium flexicaule</i> Ren. et Card. | Roth. |
| <i>Brachythecium glareosum</i> (Bruch) Bry. | <i>Cynodontium polycarpum</i> (Ehrh.) Sch. |
| Eur. | <i>Dichodontium pellucidum</i> (L.) Sch. |
| <i>Brachythecium plumosum</i> (Sw.) Bry. | <i>Dicranella heteromalla</i> (Dill.) Sch. |
| Eur. | <i>Dicranella rufescens</i> (Dicks.) Sch. |
| <i>Brachythecium populeum</i> (Hedw.) Bry. | <i>Dicranella squarrosa</i> (Starke) Sch. |
| Eur. | <i>Dicranoweisia crispula</i> (Hedw.) Sch. |
| <i>Brachythecium rivulare</i> (Bruch) Bry. | <i>Dicranum congestum</i> Brid. |
| Eur. | <i>Dicranum falcatum</i> Hedw. |
| <i>Brachythecium rutabulum</i> (L.) Bry. | <i>Dicranum flagellare</i> Hedw. |
| Eur. | <i>Dicranum fulvellum</i> (Dicks.) Sm. |
| <i>Brachythecium salebrosum</i> (Hoffm.) | <i>Dicranum majus</i> Sm. |
| Bry. Eur. | <i>Dicranum scoparium</i> (L.) Hedw. |
| <i>Brachythecium Starkei</i> (Brid.) Lindb. | <i>Dicranum strictum</i> Schleich. |
| <i>Brachythecium velutinum</i> (L.) Bry. | <i>Dicranum undulatum</i> Ehrh. |
| Eur. | <i>Didymodon rubellus</i> (Hoffm.) Bry. Eur. |
| <i>Bryhnia novae-angliae</i> (Sull. & Lesq.) | <i>Distichium capillaceum</i> (Sw.) Bry. Eur. |
| Grout. | <i>Ditrichum flexicaule</i> (Schleich.) Hpe. |

- Ditrichum homomallum* (Hedw.) Hpe.
Ditrichum pallidum (Schreb.) Hpe.
Drummondia clavellata (Dill.) Hook.
Encalypta ciliata (Hedw.) Hoffm.
Eurhynchium hians (Hedw.) Lindb.
Fissidens adiantoides (L.) Hedw.
Fissidens cristatus Wils.
Fissidens osmundoides (Sw.) Hedw.
Fissidens taxifolius (L.) Hedw.
Floribundaria pendula (Sull.) Fleisch.
Fontinalis antipyretica L.
Fontinalis hypnoides Hartm.
Funaria hygrometrica (L.) Sibth.
Georgia geniculata (Girg.) Lindb.
Georgia pellucida (L.) Rabenh.
Grimmia apocarpa (L.) Hedw.
Grimmia pilifera P. B.
Gymnostomum calcareum Nees. & Hornsch.
Hedwigia albicans (Web.) Lindb.
Helodium paludosum (Sull.) Aust.
Herpetineuron Toccoae (Sull. & Lesq.) Card.
Homomallium adnatum (Hedw.) Broth.
Hygroamblystegium filicinum (L.) Loesk.
Hygrohypnum molle (Dicks.) Broth.
Hylocomium brevirostre (Ehrh.) Bry. Eur.
Hylocomium proliferum Lindb.
Hylocomium pyrenaicum (Spruce) Lindb.
Hylocomium umbratum (Ehrh.) Bry. Eur.
Hymenostylium curvirostre (Ehrh.) Lindb.
Hypnum Schreberi Willd.
Hypnum uncinatum Hedw.
Isopterygium silesiacum (Selig.) Warnst.
Isopterygium turfatum (Lindb.) Lindb.
Leptobryum pyriforme (L.) Sch.
Leskea obscura Hedw.
Mniobryum albicans (Wahlenb.) Limpr.
Mnium affine Bland.
Mnium cinclidioides (Blytt) Hueb.
Mnium medium Bry. Eur.
Mnium orthorhynchum (Brid.) Bry. Eur.
Mnium punctatum (L., Schreb.) Hedw.
Mnium rostratum Schrad.
Mnium serratum Schrad. in L.
Mnium silvaticum Lindb.
Mnium stellare Reich.
Neckera pennata (L.) Hedw.
Neckera pusilla Mitt.
Octoblepharum albidum (L.) Hedw.
Oncophorus virens (Sw.) Brid.
Oncophorus Wahlenbergii Brid.
Orthotrichum fastigiatum Br. in Brid.
Orthotrichum Rogeri Brid.
Oxyrrhynchium praelongum (L., Hedw.) Warnst.
Oxyrrhynchium rusciforme (Neck.) Warnst.
Philonotis fontana (L.) Brid.
Physcomitrium acuminatum (Schleich.) Bry. Eur.
Plagiopus Oederi (Gunn.) Limpr.
Plagiothecium denticulatum (L.) Bry. Eur.
Plagiothecium piliferum (Sw.) Bry. Eur.
Plagiothecium silvaticum (Huds.) Bry. Eur.
Pleuroziopsis ruthenica (Weinm.) Lindb. [*Climacium ruthenicum* (Weinm.) Kindb.]
Pogonatum contortum (Menz.) Lesq.
Pogonatum urnigerum (L.) P. B.
Polytrichum alpinum L.
Polytrichum commune L.
Polytrichum formosum Hedw.
Polytrichum gracile Dicks.
Polytrichum juniperinum Willd.
Polytrichum piliferum Schreb.
Pottia intermedia (Turn.) Fuern.
Pterigynandrum filiforme (Timm.) Hedw.
Pterogonium gracile (Dill.) Sw.
Ptilium crista-castrensis (L.) DeNot.
Pylaisia intricata (Hedw.) Card.
Pylaisia polyantha (Schreb.) Bry. Eur.

- Rhabdoweisia fugax* (Hedw.) Bry. Eur.
Racomitrium aciculare (L.) Brid.
Racomitrium canescens (Weis, Timm.)
 Brid.
Racomitrium fasciculare (Schrad.)
 Brid.
Racomitrium heterostichum (Hedw.)
 Brid.
Racomitrium lanuginosum (Ehrh.,
 Hedw.) Brid.
Racomitrium patens (Dicks.) Hueb.
Racomitrium sudeticum (Funck) Bry.
 Eur.
Racomitrium varium (Mitt.) Lesq. & J.
Rhaphidostegium demissum (Wils.,
 Sch.) DeNot.
Rhodobryum roseum (Weis.) Sch.
Rhytidiadelphus squarrosus (L.) Warnst.
Rhytidiadelphus triquetrus (L.) Warnst.
Rhytidium rugosum (Ehrh.) Kindb.
Saelania glaucescens (Hedw.) Broth.
Scleropodium purum (L.) Limpr.
Sphagnum acutifolium Ehrh.
Sphagnum cymbifolium Ehrh.
Sphagnum cuspidatum Ehrh.
Sphagnum fimbriatum Wils.
Sphagnum fuscum (Sch.) V. Klinggr.
Sphagnum Girgensohnii Russ.
Sphagnum imbricatum Hsch.
Sphagnum molle Sull. (*S. compactum*)
Sphagnum molluscum Bruch.
Sphagnum papillosum Lindb.
Sphagnum recurvum P. B.
Sphagnum Russowii Warnst.
- Sphagnum squarrosum* Pers.
Sphagnum subnitens Russ.
Sphagnum subsecundum Nees.
Stereodon arcuatiformis Broth.
Stereodon arcuatus Lindb.
Stereodon circinalis (Hook.) Mitt.
Stereodon cupressiformis (L.) Brid.
Stereodon curvifolius (Hedw.) Brid.
Stereodon fertilis (Sendt.) Lindb.
Stereodon Haldanianus (Grev.) Lindb.
Stereodon imponens (Hedw.) Brid.
Stereodon plicatulus Lindb.
Stereodon pratensis (Koch) Warnst.
Stereodon reptilis (Rich.) Mitt.
Tetraplodon angustatus (L. f., Sw.)
 Bry. Eur.
Tetraplodon mnioides (L. f., Sw.) Bry.
 Eur.
Thamnum alopecurum (L.) Bry. Eur.
Thuidium delicatulum (Dill., L.) Mitt.
Thuidium minutulum (Hedw.) Bry.
 Eur.
Thuidium quadrifarium Mitt.
Tortella caespitosa (Schwaegr.) Limpr.
Tortella tortuosa (L.) Limpr.
Trichostomum cylindricum (Bruch.)
 C. M.
Trematodon longicollis Rich.
Ulota americana (P. B.) Mitt.
Webera annotina (Hedw.) Bruch.
Webera cruda (L.) Bruch.
Webera elongata (Hedw.) Schwaegr.
Webera longicolla (Sw.) Hedw.
Weisia viridula (L.) Hedw.

THE GENUS *CLAOPODIUM* IN EUROPE

WILLIAM EDWARD NICHOLSON

The name *Clao podium* was first used in 1884 by Lesquereux and James (Mosses of North America, p. 327) for a subgenus of *Hypnum* to include five species from the northwestern portion of North America, allied to *Thuidium* in the papillose areolation and the form of the leaves, but differing in the absence of filamentous paraphyllia. Lesquereux and James claim alliance with *Eurhynchium* for the subgenus, but it is difficult to see any special relationship in this direction, and Dr. G. N. Best in his Revision of the *Clao podiums* (Bull. Torrey-

Club 24: 427. 1897) is probably nearer the mark in assigning the group a position midway between *Anomodon* and *Thuidium*. In 1893 MM. Renauld and Cardot in their Musc. Am. sept. raised *Claopodium* to the rank of a genus, and it has also been adopted by Dr. Brotherus (in Engler and Prantl, Die Natürlichen Pflanzenfamilien), who omits *C. laxifolium* (Schwgr.) and includes *C. Bolanderi* Best and a few species from southern and eastern Asia. No species has been accredited to Europe, though the existence in Portugal of a plant which obviously belongs to this genus has been known for some time.

In the year 1866 Count von Solms Laubach spent some months in Algarve, the southernmost province of Portugal, exploring the moss flora; especially that of the Serra de Monchique, the results of which he embodied in his *Tentamen Bryo-Geographiae Algarviae Regni Lusitani Provinciae* (Hals, 1868). Among the mosses enumerated by him as occurring in this district was a plant which he referred to *Thuidium punctulatum* DeNot. The plant was found in the warm open parts of a chestnut wood near the town of Monchique, growing on the ground in dense sterile tufts strongly reminding him of *Anomodon attenuatus*. The identification of the plant with *Thuidium punctulatum* is a little curious, as the branching and leaves of that plant are very different and, being monoicous, it is fairly often in fruit; moreover its resemblance to the *Anomodon* is not very striking. The Algarvian plant was subsequently dealt with by Schimper in the second edition of his *Synopsis* (1876) and is doubtfully referred by him to *Leskea* as *Leskea? algarvica*.

Subsequently authors have not added much to our knowledge of the plant; Limpricht (2: 766) points out that it is doubtless a *Thuidium* as Milde had already distinguished it in his herbarium. Roth practically contents himself with quoting Limpricht and admits that he had not seen the plant. Indeed its rarity in herbaria has, no doubt, been one of the principal causes of the lack of recognition of its true affinities.

In May 1911, I spent about three weeks in Portugal in company with Mr. H. N. Dixon, F. L. S., mostly at Caldas de Monchique in Algarve. Here we found Solms Laubach's plant, not only in the dry chestnut woods where he originally found it, but also and far more luxuriantly in the dry bed of a small torrent nearer Caldas de Monchique, where for a short distance it practically carpeted the bed and banks of the torrent. We also found the same plant sparingly at Busaco and by the banks of a little streamlet at Louzá near Coimbra, from which it would seem that it has a fairly wide distribution in Portugal.

On examination of this plant on my return I recognized affinities with *Claopodium Whippleanum* (Sull.) Ren. and Card., and Mr. Dixon, on my referring to him, concurred in its belonging to *Claopodium* and suggested that it was perhaps nearer to *C. leuconeurum* (Sull. and Lesq.) Ren. and Card. M. Cardot himself, to whom the plant was submitted, also agreed in referring it to *Claopodium* and this has also been accepted by Mrs. Britton. Dr. Best, to whom the plant has been submitted by Dr. Grout, goes further and says that he is unable to distinguish our plant from *C. leuconeurum*, which in turn he considers doubtfully distinct from *C. Whippleanum*. This latter view of his is quoted, apparently with approval, by Dr. Brotherus [Die Nat. Pflanzenf. (Musc.) 1009].

In the absence of sufficient fruiting material I am unable to give any very definite opinion on the question of the identity of *C. leuconeurum* and *C. Whippleanum*. Lesquereux and James give distinguishing characters in the fruit,* apparently of some value, but so far as the vegetative characters are concerned I have carefully compared various gatherings of *C. Whippleanum*, including a small specimen of the cotype of *C. Whippleanum* kindly sent by Dr. Grout to Mr. Dixon, and *C. leuconeurum* with the Portuguese plant and, though there is a certain amount of variation in the width of the leaves, I can find nothing whatever to justify the separation of the plants on these characters.

The figure in the *Natürlichen Pflanzenfamilien*, copied from Sullivant's of *C. leuconeurum*, gives the leaf cells of this species as having normally two papillae on each cell, but in the specimens which I have examined both of this, of *C. Whippleanum* and of the Portuguese plant, I find most frequently one large papilla situated about the middle of the lumen. No fruit has ever been found on the Portuguese plant, which appears to be the male only. I have not been able to find anything except antheridia on the material which I have examined in this respect.

The occurrence of *Claopodium* in Europe is interesting and it adds another species to the rather small list of distinctively southern mosses which are common to the two continents.

The substantial identity of the nearctic and palearctic moss floras has long been recognized, and this identity is probably greater than our present nomenclature would seem to imply, as a study of the treatment of *Pseudoleskea* in the two areas and a close comparison of the forms would, I think, show. The probable distribution of this common flora by circumpolar land is also recognized, but towards the south of both areas the species tend to become more distinct. I do not, however, think that it is necessary to predicate Atlantis to account for such as do occur in both. The distribution of many of these was probably by way of circumpolar land also, though it may go back to a more remote period. A large portion of such an early flora, the remains of which are now found in the more southern parts of both regions, may well have disappeared and the survivors are limited to such parts of the two where approximately the same conditions obtain. There is no doubt a good deal in common between the climate of the coastal regions of California and that of Portugal.

Dr. Best draws my attention to another example of discontinuous distribution in the genus in the case of *C. pellucinerve* (Mitt.) Best, which is found in the Himalaya and again in the Yukon territory of Alaska.

Other southern species common to Europe and N. America are *Fabronia pusilla* Radd., *F. octoblepharis* (Schleich.) Schwgr., *Haplohymenium triste* (Ces.) Kindb., *Habrodon Notarisii* Sch. and *Trematodon longicollis* Michx. The distribution of the latter in Europe is very remarkable, as it is limited to a very few localities in Italy and the adjacent islands, where the ground is warmed

* Dr. Best in his Revision of the *Claopodiums* (loc. cit.) reduces these alleged differences in the fruit to practically nothing.

and moistened by the hot vapor from the fumaroli or smoke holes of semi-extinct volcanoes.

The story of our Portuguese plant points to the value and necessity of that interchange of ideas between the bryologists of the two continents which the "Bryologist" under Mrs. Smith's able management has done so much to promote.

If Dr. Best's identification of *C. Whippleanum* and *C. leuconeurum* with one another and with our Portuguese plant stands, as I certainly think will prove to be the case, the synonymy of the plant would seem to be as follows: that of the American plants has been taken from Dr. Best's Revision of the *Claopodiums* (loc. cit.).

Claopodium Whippleanum (Sull.) Ren. & Card. Musc. Am. sept. 1893.

Hypnum Whippleanum Sull. Pac. R. R. Rep. 4: 190. 1856.

Thuidium leuconeurum Sull. & Lesq. in Sull. Icon. Musc. Suppl. 104. 1874.

Thuidium Solmsii Milde in herb. (18—.)

Leskea? algarvica Sch. Syn. 597. 1876. (Ed. 2.)

Hypnum leuconeurum L. & J. Mosses of N. America. 328. 1884.

Thuidium leskeoides Kindb. Bull. Torrey Club 17: 277. 1890.

Claopodium leuconeurum Ren. & Card. Musc. Am. sept. 50. 1893.

NOTES ON LEPIDOZIA SETACEA

E. J. HILL

In the summer of 1907 I collected this scale moss in Bergen swamp, Genesee County, N. Y. A bed of *Sphagnum* was seen to be mixed with hepatics, and a packet of it was taken. When examined some time afterward three were found associated with the *Sphagnum acutifolium*, which formed the bulk of the packet. They were *Mylia anomala* (Hook.) S. F. Gray, *Lepidozia setacea* (Web.) Mitt. and a *Cephalozia* which in its leaf characters answered very well to *C. connivens* (Dicks.) Lindb., all of which are known to grow in *Sphagnum*. As all were without fruit the determination had to be based on other characters. *L. setacea* being new to me, and either rare or seldom detected, and liable to be confused with the more common *L. sylvatica* Evans, some was sent to Dr. Evans, who confirmed the identification. Thus another station for this species is added to the few that are definitely known in our flora. It has five in New England: Bethany, Conn.; Woods Holl, Mass.; Lonesome Lake in the Franconia Mountains, N. H.; Waterville, N. H.; and Mt. Desert, Me.

The flagella which spring from the axils of the ventral leaves of *L. setacea* were well supplied with rhizoids. These have a globose enlargement at the distal end by means of which it clings to the mosses among which it grows. They sometimes adhere so firmly that the fragile stems are broken in efforts to detach them. (See Warnstorf, Kryptogamenfl. der Mark Brandenburg 1: 257. 1902.) I found similar spheroidal expansions of the ends of some of the rhizoids of the *Cephalozia*. They were not as abundant as on the stems of the *Lepidozia*, but to all appearance serving the same purpose. Contact with

some resisting medium is generally considered to be the cause of this enlargement, as seen in the disks at the ends of tendrils in such vines as *Ampelopsis*.

If we regard rhizoids as organs for absorption as well as for holding a plant in place, such expansions fixed to the cellular walls of mosses ought to help materially in taking up the moisture with which swamp mosses, especially *Sphagnum*, are so well supplied. The water freely drawn up from below by capillarity, due to the peculiar structure of the cells of *Sphagnum* and the arrangement of its leaves and pendent branches, as obtained from rains and dews and held in storage, would thus be at the more ready disposal of the scale moss associated with it. Thus the rhizoid might prove to be of greater advantage as an organ for absorption than for mechanical support. It would be particularly serviceable to hepatics growing under the conditions of those found in Bergen Swamp. They were in the open and comparatively treeless portion of the swamp, much exposed to sun and wind.

The *Sphagnum* occurs in beds and hummocks, often but a few square feet in area, the central parts raised a foot or two above the water table. They make the beginning of a high moor formation. The surface of such beds is liable to considerable dryness in the hot days of midsummer when the water of the swamp is low or has wholly disappeared above ground. It becomes a trying season for such delicate structures as scale mosses, but the closely fitting enlarged attachment may help in making a more effective use of what water may be present in the bed of *Sphagnum*. As the *Lepidozia* was found in a small oval or bossy bed of this moss, the surface considerably desiccated in the August days, it seemed to show a fitting adaptation to the environment.

CHICAGO, ILL.

ADDITIONS TO THE LICHEN FLORA OF SOUTHERN CALIFORNIA NO. 7

H. E. HASSE M. D.

***Lecidea bullata* HASSE N. SP.**

Thallus of a few small scattered ash colored squamules or absent. Apothecia substipitate, scattered or four to eight grouped, from 0.5 mm. to 1.75 mm. wide, the separate ones being the larger; disk dull black, faintly papillate, mostly slightly concave, the larger slightly convex; margin thin, gray, or blackish gray, entire or more or less sinuose, at times deeply, almost parting the disk into several lobes; epithecium subcontinuous, bluish black to almost black, gradually paling downward; thecium colorless (lower part), about 100 μ high; paraphyses separate, stout, septate, branched, the rounded top clavate-thickened and not or but slightly colored; hypothecium pallid brownish gray; asci 88 μ long, composed of an upper oblong-ovoid bullate expansion, 28 μ to 36 μ long, 12 μ to 15 μ thick, contracting to a peduncle 60 μ to 68 μ long and 8 μ to 9 μ thick; spores ovoid and oblong-ovoid, 8 μ to 12 μ long, 6 μ to 9 μ thick, simple, colorless; hymenium not horny, with iodine staining blue to sordid greenish blue, the hypothecium greenish-

yellow, the ascus contents, bullate and peduncular part, which is evidently pervious, reddish with KHO; with NO_5 dull violet purple.

On granitic rock at Eden Hot Springs, Riverside county.

Mycoporellum Hassei A. ZAHLBR. N. SP.

Thallus epiphloeodal, effuse, whitish-ash colored, thinly squamulose. Apothecia scattered, 0.4 mm. to 1 mm. wide, dull black, flattish, under the hand-lens finely papillate; paraphyses absent; asci oblong-ellipsoid, 60μ to 80μ long, 20μ to 28μ thick, the membrane about 3μ thick, the top attenuated and solidly thickened; spores 8, colorless, bilocular, oblong, 20μ to 28μ long, 8μ to 10μ thick, the lower cell slightly thinner and longer than the upper. Hymenial gelatine with iodine pale yellow, the ascus contents pale vinous, no change with KHO.

Dr. A. Zahlbruckner writes under date of Jan. 27, 1912: "Von den uebrigen Mycoporellum Arten mit 2-zelligen, farblosen Sporen durch die grosse Zahl der Muendungen des Apotheciums (15-18) unterschieden, ausserdem von *M. Lahmi* durch kleinere Sporen und von *M. ellipticum* durch die nicht zylindrischen Sporen abweichend; am naechsten kommt sie noch der *M. Eschweileri*, doch dieses hat nur wenig Ostiola."

On *Crossosoma Californicum* Nutt., Catalina Island, near Avalon, the type locality.

The next species is believed to be new to North America.

DERMATOCARPON INTESTINIFORME (Koerb.) HASSE NOV. COMB.

Endocarpum intestiniforme Koerber, Parerga. 42. 1860.

Thallus polyphyllous, cespitose, color creamy gray or sometimes with a faint bluish tint. Borders of the central squamules deflected downward, forming bullose cavities of the coarsely areolate central part. The areoles are roundish, subangular or frequently undulate wavy, each squamule containing as a rule several apothecia; the peripheral squamules are foliaceous, expanded and subimbricate. Apothecia at first immersed, later becoming prominent, the extruding perithecium dull black with a minute ostiole, the immersed part soft, globular to flattened globular, of a pale flesh color; thecium colorless; paraphyses gelatinous, indistinct; asci cylindrical or bottle shaped; spores eight, blunt ellipsoid, colorless, faintly granular, 12μ - 18μ long, 6μ - 9μ thick; hymenial gelatine with iodine blue soon changing to orange-brown; no reaction with KHO.

On rocks and earth in rock crevices. North Fork of Matilja Cañon, Ventura Co., Eden Hot Springs and Palm Springs, Riverside Co., and Grand Cañon, in Arizona.

Of the following species all but the last were described in Tuckerman's Synopsis of the North American Lichens, but it has seemed worth while to give the more detailed descriptions based on my own observations.

LECANORA MELANASPIS (Ach.) Th. Fr. var. *alphoplaca* (Wahlenb.) Th. Fr.

Thallus crustaceous at the center, closely affixed and covered by numerous apothecia, becoming lobed towards the periphery, the lobes oblong or rounded, entire or variously divided and even stellate in outline, dull brownish gray with a more or less marked whitish margin, the peripheral lobes loosely affixed and whitish beneath, each lobe containing from one to several apothecia; apothecia,

becoming large, from 0.5 to 1.5 mm. wide, disk at first plane with an entire elevated margin, finally convex and the margin obsolete, darker in color than the thallus and at last dull black, a few disks showing a faint whitish bloom in the center but the greater number naked. Epithecium subcontinuous, brown; thecium colorless, 64μ to 72μ high; paraphyses coherent, thick (2μ to 3μ), septate, as seen after KHO, not furcate; asci clavate, 40μ long, 14μ thick, nearly reaching the colored epithecium; hypothecium colorless; spores 8, ovoid, 9μ to 11μ long, 5μ to 6μ thick, epispore thin and indistinct, the spore contents minutely granular, giving the spore-containing ascus the appearance of an *Acarospora*. Hymenial gelatine with iodine blue, rapidly changing to a rich dark copper red, the epithecium not becoming stained; KHO gives finally a sordid orange color; no change with NO_5 except a paling of the epithecium.

On quartz at Eden Hot Springs, Riverside County.

CALOPLACA POLLINII (Mass.) Jatta.

Placodium ferrugineum (Huds.) Hepp var. *pollinii* Tuck. Syn. N. A. L. 1: 177. 1882.

Thallus of minute, dispersed gray granules or obsolete; apothecia small, adnate, not over 0.5 mm. wide, disk flat, dull brown-black; epithecium granulose, pale brownish; thecium colorless; paraphyses loosely coherent, their tips globular; hypothecium colorless; asci clavate or oblong; spores 8, oblong-ellipsoid, colorless, polarilocular with a faint connecting tube, becoming plainer after KHO; 12μ to 17μ long, 5μ to 7μ thick; all structures stain blue with iodine. The mature apothecia are biatorine in aspect, but those of a younger state have a thin and inconspicuous yet distinguishable, thalline margin.

On dead wood at Eden Hot Springs, Riverside County.

LECIDEA (Section Biatorea) LEUCOPHAEA (Flk.) Th. Fr. form GENUINA (Koerb.) Th. Fr.

Thallus thin, pale gray to dirty white, of small, dispersed, flat squamules, uniting in places to an areolate crust, KHO, $\text{Ca}(\text{ClO})_2$; medullary hyphae giving no reaction with iodine. Apothecia subinnate, later sessile, from 0.3 to 1.0 mm. wide; disk flat with a subprominent margin, at length becoming convex and the margin obsolete, in color brown-black when dry, red-brown when moist, now and then conglomerate; epithecium subcontinuous, bluish black or also yellowish brown; thecium colorless, 60μ to 80μ high; paraphyses loosely coherent or separate, entire, simple, slightly thickened above; hypothecium colorless or of a pale straw color; asci clavate, eight-spored; spores colorless, simple, oblong-ovoid, 12μ to 17μ long, 7μ to 10μ thick, apparently falsely and irregularly septate, but clearing after the action of KHO; hymenial gelatine with iodine blue, soon dingy brownish and the asci vinous red; NO_5 staining the epithecium a sordid crimson.

On sandstone, Topanga Cañon, Santa Monica Range.

SCHIZOPELTE CALIFORNICA Th. Fr. Specimens have been communicated to me by Mrs. Blanche Trask, who collected it on San Clemente Island in 1902, and the species has recently been found by me on beach rocks on Catalina Island and also on rocks, but sterile, near Newport, Orange County. In both these

last stations the apothecia are less developed than in the San Clemente specimen; the spores in both insular plants are alike.

BUELLIA INQUILINA Tuck. Apothecia apparently parasitic upon the thallus of *Lecanora saxicola* (Poll.) Ach., occupying the central part of the host lichen, the color of which is changed to a sordid grayish brown, while the peripheral unoccupied lobes retain their normal color. The apothecia are sessile, solitary or, mostly, grouped and contiguous on a squamule, from 0.3 to 0.75 mm. wide; disk flat to slightly convex, slightly papillate, black, the medium thick margin also black with a slight brownish tinge; epithecium subcontinuous, of the color of Van Dyke brown; thecium colorless, 60μ to 64μ high; paraphyses loose or free with globular tips; asci clavate and inflated clavate; spores 8, brown, bilocular, ovoid-ellipsoid, both ends rounded, each loculus with a round spot, slightly constricted, 12μ to 16μ long, 7μ to 9μ thick; hypothecium concolorous with the epithecium; hymenial gelatine with iodine deep blue, the asci changing to a dark copper-red, the tops of some asci remaining blue; no change with KHO. Not having an authentic specimen for comparison, the above name of Tuckerman (Syn. 2: 105) is given provisionally, the spore measurements agreeing well with the description.

On Quartz near Eden Hot Springs, Riverside County.

ARTHOPYRENIA BIFORMIS (Borr.) Muell. Arg.

Verrucaria biformis Borrer.

Thallus silvery gray, finely squamulose-pulverulent, diffusé; apothecia scattered, prominent, semiglobular or somewhat subconical, perithecium dull black or shining, ostiole minute, punctiform depressed; paraphyses free, slender, distantly branching; asci cylindric, 100μ long, 12μ thick, eight-spored; spores ellipsoid, bilocular, colorless, 12μ to 17μ long, 7μ to 8μ thick, the partition often oblique, dividing the spore unsymmetrically; hypothecium pallid. Iodine does not stain the ascus membrane, but its contents become vinous red, the thecium and paraphyses yellow.

Catalina Island on *Heteromeles arbutifolia* (Poir.) Roem.

Determined by Dr. A. Zahlbruckner.

REVIEWS

LEOPOLD LOESKE: Studies in the Comparative Morphology and the Phylogenetic Taxonomy of Mosses. Berlin, 1910*

In German. A profoundly interesting treatise of 222 pages, with a Foreword, an Introduction, 37 meaty chapters, and a Concluding Word: all replete with suggestions, largely based on years of field observations, illuminating the phyletic relations of mosses. The author proceeds in all his discussions with refreshing courage and independence of judgment. Servility is foreign to Dr. Loeske's nature. The criticisms and strictures he makes on current moss systems and their authors show him a worthy and able, but also a courteous and

* See 3rd Cover.

cautious, debater in the arena of scientific discussion. On occasion he can be blunt: e. g. when he criticises G. Roth's "Die Europaeischen Laubmoose."

The author's Introduction, alone, is a classic. Covering thirty pages, it is more than merely an introduction; it is a learned review of existing moss systems, and a discussion of the basis of each view point, laying bare the foibles and weak points of all; it is also a clear pointer in the direction of intelligent improvement. He here shows the importance, in elaborating a system, of attaching equal importance to gametophyte and sporophyte. He brings to bear upon the problems of relationship all past and current results of microscopic and physiological study. He does more; he shows the importance of studying mosses continuously in their living conditions in the field, season after season, in order to discover the influence of changing conditions of light and moisture upon the various structures of the moss plant. In the body of the book numerous instances are cited of the discovery of relationship, or even identity, of species, especially of *Sphagna* and aquatic *Hypna*.

Each of the 37 chapters is a rounded discussion of a moss group, a unit by itself. It is unfortunate that the author disdained all headings; these and brief analytical outlines, for chapters, would make the work more easy to use in study and reference. As it is, the only convenience is an alphabetical list of the genera and families of mosses discussed in the work, some 150 in number, with page references. It would be well worth while to prepare also an alphabetical reference list of all the bryological authorities referred to in these treatises, which show Dr. Loeske an exceptionally well informed student who deserves universal respect and consideration.

The following passage translated from the Closing Word, shows fairly, well the author's viewpoint in this work. Says the author, page 219:

"More than ever does systematic bryology need to be lifted above the still prevailing stage, of the mere description of forms,—that (ancient) method which is recognized by its fond appreciation of 'good' species, and in which the 'bad' species, transitional forms and similar things are valued and represented as 'inconvenient for systematic purposes' (as is the case even in Limpricht), which sounds almost as if the external finish of the systematic palace were the chief thing. This trait, an heirloom from the times of 'absolute species' conceptions, has for a long time after Darwin seriously jeopardized the progressive development of systematic bryology. In the interests of 'types,' forms have been disregarded more than was right, barring, however, certain 'excellent varieties.' But even where forms were described, they were preferably disposed of as 'forms' of the type. It is to just such matters that unequally greater attention will need to be devoted (a course not to be confused with the uncritical making of varieties). And, next to the morphology and phylogeny of a form, its biology also is always to be taken into consideration. The growing insight into mosses in all directions will necessarily advance the progressive development of systematic bryology beyond the boundaries set heretofore in large measure by morphological considerations, in order that the herbarium odor may be lost, and that a little more of the life of the moss world may be mirrored in it."

It is impossible, in a brief review, to show up adequately the multitude

of keen arguments and excellent judgments found on every page of the book, which make it most stimulating and helpful. In his discussions he leans toward Fleischer more than toward any other contemporary; in fact he honors him with the designation of teacher. He does not suppose for a moment that all his expositions will be uniformly accepted. But he expresses the fair hope that he has been able to indicate in his fundamental view points right directions for further development of systematic bryology.

Why he did not follow up his multitude of conclusions with the presentations of a moss system of his own, he explains in the following closing quotation.

"The purpose of setting forth, simultaneously with my expositions, my own closed system of European mosses, I have given up as premature. At several places there would remain gaps; at other places the composition (Zuordnung) of several groups would have to be set down with question marks. Instead of setting up a ready made system, in which further investigations might make necessary rearrangements even in the near future, I therefore prefer to leave the entire matter for the present in a state of flux, and meanwhile to seek further light among extra-European mosses."

JOHN M. HOLZINGER, Winona, Minn.

LEOPOLD LOESKE: Revision einiger Amblystegien aus der Herbare Limpricht. (Ungarischen Botanischen Blaetter. Jahrg. 1911. No. 8-10. pp. 272-7.)

The author's studies were mainly confined to the specimens of *Amblystegium leptophyllum*, *A. rigescens*, *A. trichopodium*, and *A. Hausmannii*, preserved in the Limpricht herbarium at Budapest, but comparisons were made with authentic specimens and original collections from the herbaria of Juratzka and Blandow.

The following conclusions are drawn. The specimen from Travemuende mentioned by Warnstorff in the Kryptogamenflora der Mark Brandenburg as *Leptodictyum trichopodium* (Schultz) Warnst. is in part *A. compactum*. *A. trichopodium*, *Kochii*, and *curvipes* belong to the same group of forms, the first being separable only as a subspecies at most. *A. Hausmannii* is only a form of *A. leptophyllum*, and the latter a small, xerophilous form of *A. riparium*. There is no difference between *A. Juratzkanum* and *A. radicale* (P. B.) Mitt. (*sensu* Limpr.). The type material of *A. rigescens* shows this to be a depauperate form of *A. serpens*. The material representing *A. hygrophilum* in Limpricht's herbarium seems to contain several different forms, and at present it is impossible to draw conclusions regarding this species.

Students of the perplexing subject of the American forms of *Amblystegium* will find much of interest in this paper, especially in the descriptive notes. Herr Loeske promises further notes as the result of studies now in progress.

EDWARD B. CHAMBERLAIN.

NEW NORTH AMERICAN MOSSES

BY CARDOT

In the Revue Bryologique for 1909, 1910 and 1911, M. Cardot has published his notes on the mosses collected in Mexico by the late Cyrus G. Pringle.

The richness of these collections in new species and genera was "truly stupefying" to M. Cardot as in the first 75 species identified he found 34 new species and 5 new genera. Anything like a complete list of all the new species discovered and described by M. Cardot in the Pringle collections is out of the question, but among those described in these papers is one from Arizona and several that had been sent me for determination by Mr. E. O. Wootton and which I had passed up to M. Cardot as being unknown to me. There are still others of those sent by Mr. Wootton that I think are new and have manuscript names in my collection, but are waiting time and opportunity for a final decision and a description.

These mosses were picked up incidentally by Mr. Wootton and his assistants in the mountains of New Mexico and their novelty and interest have given me a stern resolve to visit that region myself as soon as circumstances permit, for I do not believe a more fruitful field for interesting bryological discoveries exists in the United States.

Rev. Bryol. 36: 113-114. 1909.

"*BRYUM NEOMEXICANUM* Card.—Synoicous. Nearest to *B. intermedium* Brid. from which it differs in the more distinctly margined leaves with the margins more widely and less longly revolute, sometimes subplané, those of the sterile innovations with a percurrent costa, not excurrent, and capsules with a wider mouth. Stem very short. Leaves narrowly revolute in the lower half or a little beyond, entire or minutely denticulate toward the apex, marginal cells yellowish, linear, two- to three-ranked; costa in the leaves of the fertile stems quite long excurrent. Capsule on a seta about 2 cm. long, pendent, cernuous or horizontal, with a long neck, operculum apiculate. Peristome teeth yellowish with 18 to 22 lamellae, cilia appendiculate."

"New Mexico: Socorro County (O. B. Metcalfe, 1903; comm. A. J. Grout)."

"*BRYUM LONGICOLLE* Card.—Synoicous. Tufts low, 5-6 mm. in height, within densely fuscous-tomentose. Leaves near the apex of the stem loosely appressed, spreading when dry, somewhat flexuose, rather narrowly lanceolate-acuminate; costa somewhat excurrent, cuspidate; margin strongly revolute from the base to the apex, very slightly denticulate above; costa strong, red at base, capsule cernuous or subhorizontal, ovate or oblong, subsymmetric, neck longer than the sporangium, attenuate, sometimes curved; operculum convex, rather longly and acutely apiculate; seta 2 to 2.5 cm. long. Teeth of peristome narrowly lanceolate with 18 to 22 lamellae; membrane of inner peristome very high, segments open along the keel, cilia 2 or 3, either free and appendiculate or more or less coherent and nodulose. Differs from *B. meeseoides* Kindb. and the related species by the synoicous inflorescence, the subsymmetric capsule, the long neck, and the cilia often coherent, in which case they are simply nodulose."

"Arizona, Huachuca Mts. 1884. Pringle No. 23."

"Rev. Bryol. 37: 8. 1910.

"POROTHAMNIUM (?) NEOMEXICANUM Card.

"Soft, delicate, dull green, primary stem creeping, secondary 2-3 cm. long, irregularly pinnate to the base with compressed, widely spreading obtuse or attenuate branches. Leaves six-ranked, soft, complanate, somewhat asymmetric, oblong, broadly and shortly acuminate, acute or subobtuse, toward the apex minutely denticulate or subentire, lower margins subundulate and broadly reflexed, then more or less revolute, sometimes nearly plane on one side; costa thin, green, extending to the middle or a little beyond; cells unequal, ovate, oblong and linear, upper shorter, rhomboidal, alar minute, quadrate or roundish. Perichaetial leaves convolute, long-acuminate, ecostate, entire; basal cells hyaline. Fruit lacking."

"New Mexico: Socorro County, Mt. Mogallan, near the west branch of the Gila river (O. B. Metcalfe, 1903, comm. A. J. Grout.)"

"The affinities of this species are very obscure. I had placed it with some doubt in the genus *Neckera*. I am here following the opinion of M. Brotherus, who thinks it is rather a *Porothamnium*. The classification of this moss cannot be definitely fixed until the fruit is found. In any case it differs considerably from the *P. Bigelovii* (Sulliv.) Fleisch. from the Western United States, in its habits, its smaller size, dull green color, looser basal areolation of its soft short wide leaves, slightly denticulate to subentire."

"Rev. Bryol. 37: 53-54. 1910.

"HOMOMALLIUM MEXICANUM Card.—Monoicous, rather robust, green or yellowish-green. Stem creeping, more or less regularly pinnate, branches short, ascending. Leaves appressed upwards, somewhat homomallous, erect open, ovate-lanceolate, long acuminate, margins plane, entire or sinuate-subdenticulate above; costa very short or lacking; cells linear, flexuose, obtuse with rather thick walls, alar numerous, subquadrate or roundish, obscure, chlorophyllose. Perichaetial leaves long cuspidate-subulate, margins entire or sinuate. Capsule about 10 mm. long, horizontal, ovate-oblong, curved, convex above and contracted under the mouth when dry; operculum conic, short rostrate; seta reddish"

"More robust than *H. adnatum* (Hedw.) Broth. (*Amblystegiella adnata* (Hedw.) Nichols.)"

"Var. *latifolium* Card. Differs from the type as follows: Leaves broadly ovate, strongly concave and more imbricate, acumen broader and shorter, alar cells very numerous and somewhat larger and capsule suberect and inclined."

"New Mexico, White Mts., Lincoln Co., Wooton and Standley, 1907; comm. A. J. Grout."

l. c. 57.

"PLAGIOTHECIUM LAETUM B. & S. var. NEOMEXICANUM Card. Has the habit of the typical European form. It is also similar in size, shape and, areolation of leaves and all the characters of the capsule. It differs in having the transverse striations at the base of the peristome teeth merely on the back??, and the lamellae on the inside less numerous and narrower and the basal membrane of the inner peristome short, extending 1-5 the length of the teeth."

"Sacramento Mts., New Mexico, Otero Co., E. O. Wooton, 1889, comm. A. J. Grout."

A. J. GROUT.

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Mr. C. C. Kingman, 11 Lowell St., Reading, Mass. *Dicranoweisia cirrhata* (L.) Lindb. cfr. and *Antitrichia Californica* Sulliv. Both collected in Southern California.

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Mr. George B. Kaiser, 524 Locust Ave., Germantown, Pa.—*Amblystegium riparium* B. & S. var. *longifolium* (Schultz) B. & S. cfr. Collected in Maine by Edward B. Chamberlain. *Ptychomitrium nigricans* (Kunz.) B. & S. [*Glyphomitrium nigricans* (Kunz.) Mitt.] Collected by H. N. Dixon and W. E. Nicholson in Southern Portugal, the only known European locality for this moss.

Edward B. Chamberlain, 38 West 59th St., New York City.—*Hyophila riparia* Aust. and *Conomitrium Julianum* Savi. Collected in northern Italy, by Signor Corti.

Dr. John L. Sheldon, West Virginia University, Morgantown, West Va.—*Rhabdoweisia fugax* (Hedw.) B. & S. cfr. Collected in West Virginia.

NOTES

We need a number of short pithy articles, giving observations of interest, made by our members. When you find a rare moss in a new station send us a short note. When you notice an interesting abnormality, write it up. The Bryologist is much more technical and less popular than at first, but we would gladly publish more popular articles, especially short notes, if we had them.

PLAGIOTHECIUM GEOPHILUM (Aust.) Grout (*Rhynchastegium geophilum* Aust.) is a little known and rarely collected moss that chapter members should look out for. The leaves somewhat resemble those of *Eurhynchium hians* in shape and serration, with many having a rather blunt apex, but the costa is short and double and the plants inhabit moist soil and stones. It has been sent me but once for determination, by Dr. H. S. Jewett from Yellow Springs, Ohio, and I have collected it once, in a spring near Richmond, Staten Island.

A. J. G.

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CONTENTS

Notes on North American Hepaticae (*Illus.*)

Alexander W. Evans 54

Notes on North American Sphagnum III

A. LeRoy Andrews 63

Review—A Recent Contribution to the Ecology of Mosses

Lincoln W. Riddle 67

Society Notes—

69

A Correction, *H. S. Jewett*

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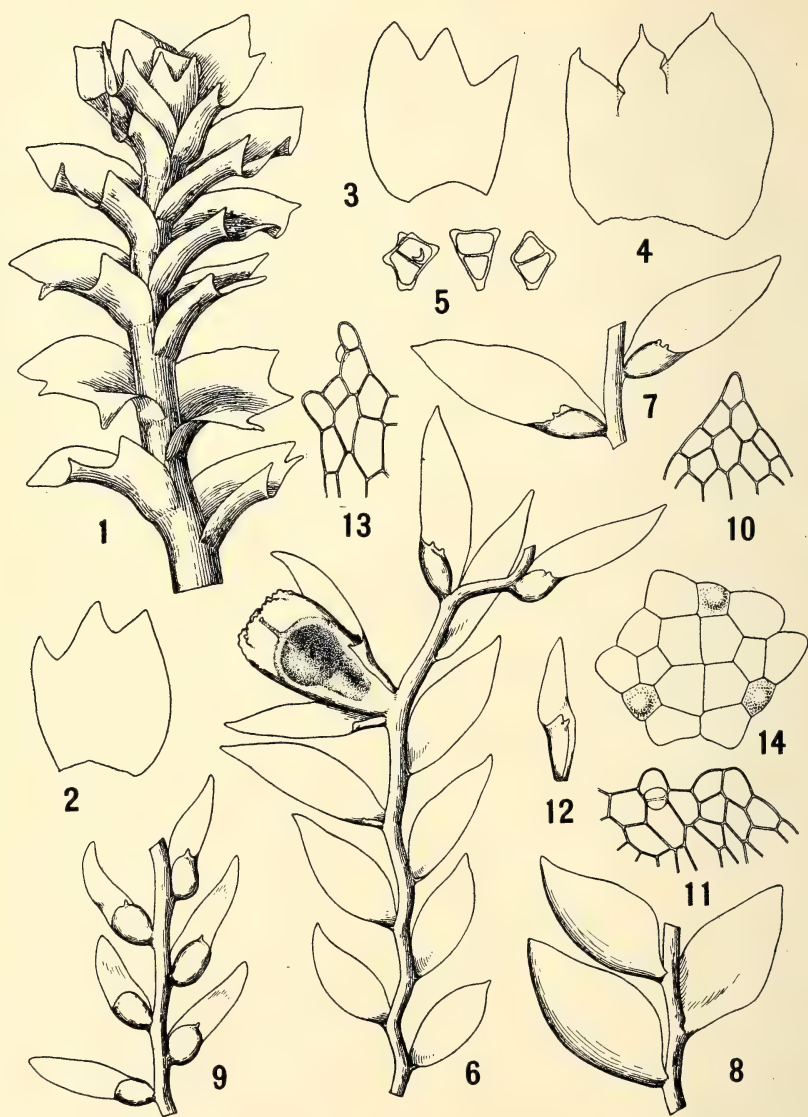


PLATE II

- 1—5. SPHENOLOBUS SCITULUS (Tayl.) Steph.
6—14. COLOLEJEUNEA CAMILLI (Lehm.) Evans.

THE BRYOLOGIST

VOL. XV

JULY 1912

No. 4

NOTES ON NORTH AMERICAN HEPATICÆ. III.

ALEXANDER W. EVANS

WITH PLATE II

In the present paper ten species of Hepaticæ are considered, four of which are tropical Lejeuneæ. The others include two species, *Pallavicinia hibernica* and *Sphenobolus scitulus*, which have been more or less misunderstood by writers. Five of the species discussed are accompanied by critical remarks, but the others are introduced to indicate extensions or restrictions of geographical distribution.

I. PALLAVICINIA HIBERNICA (Hook.) S. F. Gray.

Collected in September, 1911, at Lake Tetachuck, British Columbia, in a boggy meadow, by A. H. Brinkman (*No. 90*), altitude 3400 feet. The preent, species has been cited several times in the literature as a North American plant but most of the records have been based on incorrect determinations and its range is therefore very incompletely known. As long ago as 1838, Nees von Esenbeck, who considered *P. hibernica* a variety of *P. Lyellii* (Hook.) S F., Gray, listed specimens from Newfoundland, which had been sent him by Montagne.¹ The second record is apparently that of Webber,² who reported the

¹ Naturg. der europ. Leberm. 3: 347. 1838.

² Cat. Fl. Nebraska 93. 1890.

EXPLANATION OF PLATE II

SPHENOBOLUS SCITULUS (Tayl.) Steph.

FIG. 1. Part of a stem, dorsal view, $\times 25$.

FIGS. 2 and 3. Leaves spread out, $\times 25$.

FIG. 4. Perichæatial bract, $\times 25$.

FIG. 5. Gemmæ, $\times 300$.

The figures were all drawn from specimens collected at Tetachuck Lake, British Columbia, by A. H. Brinkman (*No. 128*).

COLOLEJEUNEA CAMILLI (Lehm.) Evans

FIG. 6. Part of a female plant with a perianth, ventral view, $\times 50$.

FIG. 7. Two leaves with well developed lobules, ventral view, $\times 50$.

FIG. 8. Three leaves with poorly developed lobules, dorsal view, $\times 50$.

FIG. 9. Part of an antheridial branch, ventral view, $\times 50$.

FIG. 10. Apex of a leaf lobe, $\times 225$.

FIG. 11. Apex of a well developed lobule, $\times 225$.

FIG. 12. Perichæatial bract with well developed lobule, $\times 225$.

FIG. 13. Apex of lobule of bract, $\times 225$.

FIG. 14. Gemma, $\times 300$.

The figures were all drawn from the Jamaican specimens collected by the writer (*No. 280*).

The May BRYOLOGIST was issued May 13, 1912.

species from Belmont and Dismal River, Nebraska. This record was based on determinations made by Underwood, who soon afterwards catalogued the plant from British Columbia without giving definite localities.¹ A few years later, the writer listed it from Yakutat Bay, Alaska, on the basis of specimens collected by Coville and Kearney, while members of the Harriman Expedition.² In 1902, J. Macoun³ brought together all the records he could find from Alaska and Canada, including one from Huntingdon, Ontario, another from Lake Louise, near Laggan, Alberta, and a third from the vicinity of Griffin Lake, Gold Range, British Columbia. These three records were based on specimens collected by himself and determined by Underwood, and it is probable that the earlier record from British Columbia referred to the Gold Range specimens.

At the time that most of these records were published, *P. Flotowiana* (Nees) Lindb. was considered synonymous with *P. hibernica*, although certain writers recognized it as a variety. In 1899, however, Warnstorf⁴ expressed the opinion that the differences between them were sufficient to justify a specific separation, and this view is now held by many recent writers. In 1904, the writer reported *P. Flotowiana* from Massachusetts⁵ and referred to this same species the Alaskan specimens which he had previously called *P. hibernica*. Since that time, the specimens from Nebraska, Ontario, Alberta, and the Gold Range have been examined, and these seem also to belong to *P. Flotowiana* rather than to *P. hibernica*. The only records now left for the species are the one from Newfoundland, which ought to be further investigated, and the new one from British Columbia noted above. In northern Europe, *P. hibernica* has a wide distribution, although nowhere abundant.

The differences between *P. hibernica* and *P. Flotowiana* are clearly given by Warnstorf and also by Müller⁶ and are almost entirely drawn from the vegetative characters of the gametophytes. In *P. hibernica* the midrib of the thallus, which is triangular in section, is 8–14 cells thick in the middle, while the wings are plane or nearly so. In *P. Flotowiana*, on the other hand, the midrib, which is trapezoidal in section, is 16–22 cells thick, and the wings are more or less crispate. Brinkman's specimens resemble slender forms of *P. Lyellii* and have a similar odor. They are characterized, however, by the frequent forking of the thallus and by the fact that the midrib is uniform in texture. In *P. Lyellii* the thallus almost invariably branches in an intercalary manner from the lower surface of the midrib, while the latter is traversed by a median strand of narrow elongated cells.

2. NARDIA GEOSCYPHUS (De Not.) Lindb.

Collected in May, 1910, near Yarmouth, Nova Scotia, on earth along a roadside, by J. Macoun (*No. 43*). The species is new to eastern Canada but has

¹ Zoe 1: 365. 1891.

² Proc. Wash. Acad. 2: 291. 1900.

³ Cat. Canadian Plants 7: 8. 1902.

⁴ Allgem. Bot. Zeitschr. 1899: 15.

⁵ Rhodora 6: 165. 1904.

⁶ Rabenhorst's Kryptogamen-Flora 6: 359. 1908.

already been reported in New England from New Hampshire and Massachusetts.¹ It is known also, in North America, from Greenland, Alaska, and British Columbia, and is widely distributed in Europe.

3. *SPHENOLOBUS SCITULUS* (Tayl.) Steph. Bull. de l'Herb. Boissier II. 1: 176. 1902. *Jungermannia scitula* Tayl. Lond. Jour. Bot. 5: 274. 1846. *Diplophyllia exsectaformis* (Breidl.), var. *æquiloba* Culmann, Rev. Bryol. 32: 73. f. 1-8. 1905. *Sphenobolus exsectiformis*, var. *æquiloba* Culmann; C. Müll. Frib. Rabenhorst's Kryptogamen-Flora 6: 611. f. 206. 1910. (FIGURES 1-5.)

Collected on earth, by A. H. Brinkman, at two stations in British Columbia, namely: Cogas Lake, Nicola River, July, 1910 (No. 249), altitude 4400 feet; and Tetachuck Lake, October, 1911 (No. 128), altitude 3250 feet. Both specimens are gemmiparous and the second shows weathered perianths. *Sphenobolus scitulus* is a species which has not been very widely accepted by writers. It was originally described from gemmiparous but otherwise sterile material collected by Drummond in North America, nothing more definite about the type locality being stated. In all probability it was somewhere in western Canada. In 1873 Austin² reduced the species to synonymy, including it under *Scapania exsecta* (Schmid.) Aust., now known as *Sphenobolus exsectus* (Schmid.) Steph. Pearson³ accepted Austin's opinion and regarded *Jungermannia scitula* as a form of *J. exsecta* Schmid. in which the leaves were more uniformly tridentate than in typical European specimens. At that time (1890) *J. exsecta* was defined in a rather broad sense and included not only the *S. exsectus* of later writers but also *S. exsectaformis* (Breidl.) Steph., a species proposed by Breidler in 1894, under the name of *J. exsectaformis*.⁴ In 1902 Stephani placed the genus *Sphenobolus* upon a definite basis and recognized *S. scitulus* as a species, as well as *S. exsectus* and *S. exsectaformis*. The only specimens which he cited under *S. scitulus* were the original plants of Drummond. At about the same time, however, Macoun⁵ listed several Canadian plants under the name *Lophozia exsecta*, var. *scitula* (Tayl.) Pears., stating that the variety was scarcely distinct from the type. Whether these specimens represent the *Sphenobolus scitulus* of the present paper has not yet been determined. When Culmann published his variety *æquiloba* he intimated that he considered it a distinct species, and Müller states that this view may be correct, although he prefers to regard the plant as a variety until more is known about it. Müller cites only three European stations, two of which are in Switzerland and the third in Bulgaria. In studying Brinkman's specimens the writer had the privilege of comparing them with a portion of the type of *J. scitula* from the Taylor herbarium and also with a

¹ See Evans, Rhodora 9: 57. 1907. A full synonymy of the species is given here.

² Hep. Bor.-Amer. 21. 1873.

³ List Canadian Hepat. 21. 1890.

⁴ Mitth. d. Naturw. Ver. Steiermark 30: 321. 1894.

⁵ Cat. Canadian Plants 7: 23. 1902.

plant of the variety *aquiloba*, collected by Culmann at the Gemmi in Switzerland, the type locality. All evidently represent the same species.

In size *S. scitulus* equals robust forms of *S. exsectus* or *S. exsectaeformis*. The plants grow in depressed mats and are dull green, becoming brownish with age. The shoots are prostrate in their older parts and produce rhizoids in abundance; the apical parts, however, especially if gemmiparous, are ascending and develop few or no rhizoids. The stems, which are usually pigmented with purplish brown, are about 0.3 mm. in diameter and extend for long distances without branching.

The leaves are more or less imbricated and spread obliquely (FIG. 1). The line of attachment of a leaf consists of two parts, which form a broad angle with each other. The dorsal part is short and transverse, while the ventral part is longer and directed obliquely forward, thus making the leaves succubous. When spread out flat the leaves appear oblong-quadrate (FIGS. 2, 3) and measure about 1 mm. in length and 0.9 mm. in width. At the broad apex they are subequally three-lobed for about one-fourth their length. The lobes vary from acute to obtuse and the sinuses separating them are rounded. When a leaf is still attached to the stem it is usually complicate with a rounded keel, the ventral portion with two lobes corresponding to the longer ventral portion of the line of attachment. In some cases, however, the keel is practically obsolete and the leaf appears explanate. Under these circumstances the transverse attachment at the dorsal base shows that the plant is a *Sphenolobus* rather than a *Lophozia*. The leaf cells average about 25 μ along the margin of the leaf and about 28 μ in the median and basal portions; sometimes they are a little longer than broad. The trigones are well developed and occasionally confluent. In most cases they are triangular with more or less bulging sides. Underleaves are not present.

As in most if not in all members of the genus, *S. scitulus* is dioicous. The perichætal bracts are more closely crowded than the ordinary leaves and are somewhat larger, measuring about 1.3 x 1.2 mm. The ventral lobe tends to be a little larger than the other two, the sinuses are sharp, and the apices of the lobes are acuminate or even cuspidate (fig. 4). In one instance a lobe was observed in which a sharp lateral tooth was developed near the apex. There are no bracteoles. The perianth, which measures about 3 mm. in length and 1 mm. in diameter, is cylindrical, although sometimes slightly dilated in the basal half. In the upper portion it is four- or five-plicate with rounded keels, the latter becoming more pronounced toward the apex, which is not markedly contracted. The mouth is irregularly and not deeply cleft, the lobes being more or less denticulate. Most of the teeth are very short, but a few are two or three cells long.

Although no antheridia were demonstrated in the material examined a few leaves were found which were evidently perigonal bracts. They occurred in small clusters of from one to three pairs and indicated that the male inflorescence, although at first terminal, soon became intercalary through proliferation. The bracts resemble ordinary leaves in most respects but are saccate at the

base, the keel being arched. They also differ in the fact that the dorsal lobe, which covers over the basal pocket, is shorter than the others and suberect.

The production of gemmæ is an exceedingly common phenomenon in *S. scitulus*. They are borne on the apices of leaf-lobes, and sometimes a long succession of gemmiparous leaves may be observed. Eventually, however, the growth of the shoot is brought to an end and the last leaves produced remain rudimentary. Apparently the leaf-lobes are normally acute, and the blunt lobes which are so often present indicate that the leaves have been gemmiparous. The gemmæ themselves are golden-brown, angular bodies, with slightly thickened walls (FIG. 5). They are usually divided into two cells and measure 20–25 μ in length.

The gemmæ and leaf-cells of *S. scitulus* are very much like those of *S. exsectaformis*, although the trigones in the second species are not always well developed. In *S. exsectaformis*, however, there is a sharp disparity in size between the tooth-like dorsal lobe and the ventral lobe, while the latter, although sometimes shortly bilobed at the apex, is often acuminate and undivided. Explanate leaves bring out the differences between the lobes even more strikingly than leaves in their normal position on the stem and are in marked contrast to the leaves of *S. scitulus* with their three subequal lobes. Another close relative of *S. scitulus* is *S. politus* (Nees) Steph., which also is characterized by equally three-lobed leaves and by leaf-cells with conspicuous trigones. But the leaves in *S. politus* tend to be scattered along the stem, the lobes are blunter than in *S. scitulus*, and the leaf-cells are larger, measuring (according to Müller) 25–45 μ in the middle of the leaf and still more at the base. *S. politus* is widely distributed in Europe and is also cited in the literature from Greenland, Alaska, Ellesmere Land, Quebec, and British Columbia.

4. CEPHALOZIA FRANCISCI (Hook.) Dumort.

Collected in May, 1910, near Yarmouth, Nova Scotia, on earth along a roadside, by J. Macoun (*No. 41*). The second record for North America. The first record was based on specimens collected by Mrs. A. R. Northrup in the vicinity of Prospect Harbor, Maine, in August, 1902. These specimens were reported upon by Miss Haynes.¹ A third station for the species, also in Maine, was discovered by the writer at Eastport, in August, 1911. In northern Europe *C. Francisci* is widely distributed, although not abundant.

5. SCAPANIA PORTORICENSIS Hampe & Gottsche.

Collected in April, 1902, on Turquino Mountain, Santiago de Cuba, by S. H. Hamilton (*No. 5875*). The first record for the island of Cuba. The species was originally described from specimens collected by Schwanecke in Porto Rico but is now known also from Jamaica, Colombia, Ecuador, Bolivia, and Brazil. In Müller's Monograph of the genus *Scapania* the plant is described and figured in detail with a full synonymy.²

¹ Torreyia **3**: 40. 1903.

² Nova Acta Acad. Cæs. Leop. Carol. **83**: 150. *pl. 18*. 1905.

6. *Cololejeunea Camilli* (Lehm.) comb. nov. *Lejeunea Camilli* Lehm. Pug. Plant. 10: 15. 1857. *Lejeunea (Colo-Lejeunea) Montagnei* Lehm.; Stephani, Hedwigia 29: 96. 1890. Not *Lejeunea Montagnei* Gottsche, now *Euomsolejeunea Montagnei* (Gottsche) Steph. (FIGURES 6-14.)

Collected in July, 1903, near Mabess River, Jamaica, on living leaves, by the writer (No. 280). The determination is based on a fragmentary specimen in the herbarium of the British Museum, collected by Ule in Brazil (No. 260) and determined by Stephani as *Cololejeunea Montagnei*, a name which has never been formally published. The type specimen of *L. Camilli* is unknown to the writer, and the same thing is true of the type specimen of *L. (Colo-Lejeunea) Montagnei*. It should be noted, however, that both specific names were given by Lehmann, that both were applied to Cuban specimens obtained from Montagne, and that the original description of *L. Camilli* agrees in all essential respects with Stephani's description of *L. (Colo-Lejeunea) Montagnei*. It is probable that Lehmann first called the plant *L. Montagnei* in his manuscript and then, upon learning that the same name had already been applied to another species, altered the name in his published paper to *L. Camilli*, thus using the Christian name of Montagne instead of the surname. Apparently Stephani overlooked Lehmann's description and, upon recognizing the distinctness of the species, published it under Lehmann's original manuscript name. Unfortunately the writer has been unable to establish these ideas conclusively. According to Stephani the species occurs in Mexico as well as in Cuba, so that it is evidently widely distributed in the American tropics.

The Jamaican specimens referred to *C. Camilli* grow scattered or in depressed mats, the plants rarely overlapping. The stems are very delicate, measuring about 0.03 mm. in diameter, and are either simple or sparingly and irregularly branched, the branches spreading widely. The leaves are distant or contiguous and spread more or less from the axis (FIGS. 6-8). The lobes vary from ovate to lanceolate, tapering toward both base and apex and attaining a maximum size of about 0.7 x 0.25 mm. They are characterized further by being scarcely or not at all falcate and by having an entire margin and an acute or obtuse apex, usually tipped with a single cell (FIG. 10). The lobule is almost always reduced to a minute basal fold. When fully developed (FIG. 7) it is ovate and inflated and measures about 0.2 x 0.1 mm. Under these circumstances the apical tooth consists of a single cell with a hyaline papilla at its base but on the inner surface (FIG. 11). The cell is in direct union with three cells of the lobule, one of which is connected also with the blunt proximal tooth, usually consisting of two projecting cells side by side. The leaf-cells average about 14 μ along the margin of the lobe and 25 x 14 μ in the median and basal regions. The walls are everywhere thin and destitute of trigones.

The inflorescence seems to be constantly dioicous. The female flower terminates the main stem or a leading branch and innovates on one side (FIG. 6), the innovation apparently continuing the female axis and sometimes bearing a second archegonium. In rare cases two subfloral innovations are produced.

The bracts spread obliquely and are complicate with a sharp but wingless keel. The lanceolate lobe measures about 0.45×0.14 mm., the apex is acute or obtuse, and the margin is either entire or shows one or two projecting cells. The lobule is ligulate or linear, about 0.17×0.05 mm., and shows, in normal cases (FIGS. 12, 13), an apical tooth composed of two superimposed cells and a sharp proximal tooth; these peculiarities, however, are often poorly brought out. The perianth (FIG. 6) is obovoid and measures about 0.6 mm. in length by 0.25 mm. in diameter. Although terete in the lower part it is indistinctly five-keeled toward the apex, the keels being usually reduced to short rows of projecting cells; otherwise the surface is smooth. The apex is truncate and the beak is short and often indistinct. The male inflorescence is terminal on the stem or on a leading branch, and no cases of proliferation have been observed. The monandrous bracts are mostly in from three to ten pairs and become separated with age (FIG. 9). They resemble the leaves but are smaller and have a more strongly inflated lobule. The capsule is about 0.15 mm. in diameter, and the spores, which are greenish and scarcely roughened, are about 8μ wide.

Vegetative reproduction is carried on by means of discoid gemmæ, which are alluded to in Lehmann's original description. They are produced in considerable abundance and conform closely to the type found in other members of the genus. A mature gemma (FIG. 14) shows that the apical quadrants cut off only two segments apiece. Each half consists of eight cells, there are three organs of attachment, and usually five of the marginal cells project.¹

Most species of *Cololejeunea* are exceedingly variable, and *C. Camilli* is no exception to this rule. The variability shows itself particularly in the form and size of the leaf-lobes and in the degree of complexity which is attained by the lobules. Much of this is due simply to arrested development, but, since this condition sometimes persists in male plants until the formation of antheridia, it cannot be left wholly out of consideration. In one case, for example, a plant growing from a gemma produced a few rudimentary leaves and then, without branching, formed a short antheridial spike of the usual type, thereby terminating its growth. The female plants seem invariably to reach a higher stage of development than the male plants, but even in these the lobules are usually represented by minute basal folds and the lobes fall short of reaching the maximum size.

One of the closest allies of *C. Camilli* is *C. diaphana* Evans,² originally described from Florida but since detected in material from Porto Rico.³ This species grows on both bark and leaves. It is even more delicate than *C. Camilli*, its leaves are somewhat smaller, measuring about 0.45×0.2 mm. in maximum size, and the margins of the lobes are minutely crenulate or denticulate from projecting cells. It differs further in its autoicous inflorescence and in

¹ For a recent account of the genus *Cololejeunea* and its gemmæ, see Evans, Bull. Torrey Club **38**: 251-286. pl. 11, 12. 1911.

² Bull. Torrey Club **32**: 184. pl. 5, f. 9-14. 1905.

³ Bull. Torrey Club **38**: 259. text-fig. 1, F. 1911.

its denticulate bracts. The gemmæ in *C. diaphana* are somewhat more complex than in *C. Camilli*, each half being composed of ten or twelve cells and each apical quadrant cutting off three or four segments. In other respects the gemmæ are much the same, each kind showing three organs of attachment and projecting marginal cells.

7. *LEJEUNEA SPINILOBA* Lindenb. & Gottsche; G. L. & N. Syn. Hep. 770. 1847.

Collected in September, 1910, at San Diego de los Baños, Pinar del Rio, Cuba, on limestone rocks, by N. L. Britton, F. S. Earle, and C. S. Gager (No. 6722). New to the West Indies. The species was based on specimens collected by Liebmann at Colipa, Vera Cruz, Mexico. In 1890 it was found by C. G. Pringle at Tamasop, San Luis Potosi, Mexico. No other stations have been reported. In the original description of this interesting species only the vegetative organs are alluded to. Later, however, Gottsche added an account of the bracts and perianths.¹

The most striking feature about the plant is the lobule. Instead of being in the form of a short inflated sac, as is usual in the *Lejeuneæ*, it is a slender and plane lamina, ligulate to lanceolate in outline and extending parallel or nearly so close to the axis. It is sometimes straight but is often more or less curved with the concavity turned toward the axis. When well developed the lobule, which measures about 0.35 x 0.06 mm., is mostly fifteen to eighteen cells long and three or four cells wide throughout the greater part of its extent. It tapers somewhat toward the apex, which is commonly tipped by two cells side by side, more rarely by a single cell. The hyaline papilla is apical in position. In poorly developed plants the lobule may be only two cells wide. The lobe measures about 0.7 x 0.55 mm.; it spreads widely from the axis and is broadly ovate and entire with a rounded apex. The leaf-cells, which are about 25 μ in diameter in the middle of the lobe, have thin walls with minute and indistinct trigones. The underleaves measure about 0.35 x 0.15 mm. They are distant, narrowly ovate, and sharply bifid for about half their length with erect lanceolate divisions. In the perichaetial bracts the lobules are usually five or six cells broad and are more sharply pointed than in the leaves, the apex being commonly tipped with two superimposed cells. The perianth is five-keeled, the dorsal keel being short and low.

A close relative of *L. spiniloba* is *L. pililoba* Spruce,² a species now known from southern Florida and from several of the West Indian Islands. In this plant the lobule is filiform and consists of a single row of cells throughout most of its length. Here, as in *L. spiniloba*, the hyaline papilla is situated at the apex. The generic position of these two species is a matter of some doubt. At one time the writer regarded *L. pililoba* as a member of the genus *Cheilolejeunea*.³ Afterwards, however, he proposed that this genus should be defined in a narrower

¹ Mex. Leverm. 213. 1863.

² Jour. Linn. Soc. Bot. 30: 346. pl. 23, f. 6-8. 1894.

³ Mem. Torrey Club 8: 147. 1902.

sense than heretofore,¹ one result being that *L. pililoba* would now have to be excluded from it. On the whole it would perhaps be wisest for the present to retain both *L. pililoba* and *L. spiniloba* in the genus *Lejeunea*.

8. MICROLEJEUNEA RUTHII Evans, Mem. Torrey Club 8: 161. pl. 21, f. 11-19. 1902.

Collected in September, 1910, in the vicinity of Highlands, North Carolina, on the bark of hemlock and *Kalmia*, by A. H. Graves. Heretofore known only from Big Frog Mountain, Tennessee, the type locality. Most of the North Carolina material represents a juvenile condition of the plant, in which some of the specific characters are not clearly manifested. On many of the shoots, for example, the lobes of the leaves are only a little longer than the lobules, and the divisions of the underleaves are only two cells wide at the base. Fortunately a careful search brought to light several stems in which the lobes were about twice as long as the lobules, while the divisions of the underleaves were four cells wide at the base, agreeing in these important respects with typical forms of the species. If it had not been for the presence of these better developed plants the determination of the specimens would have been doubtful, since the juvenile conditions of the various species of *Microlejeunea* sometimes approach one another very closely. The plants growing on hemlock were accompanied by *Frullania Asagrayana* Mont., a sterile *Radula*, and a poorly developed *Plagiochila*.

9. BRACHIOLEJEUNEA DENSIFOLIA (Raddi) Evans, Bull. Torrey Club 35: 158. 1908.

In Spruce's account of the Hepaticæ collected by W. R. Elliott on the islands of St. Vincent and Dominica, he cites the present species, which is commonly called *B. bicolor* (Nees) Schiffn., from Fancy Farm, St. Vincent, basing his record on a portion of No. 343.² In examining the material preserved under this number in the herbarium of the British Museum the writer found only *B. corticalis* (Lehm. & Lindenb.) Schiffn., a species which Spruce does not list at all. Apparently he confused the two species, which certainly resemble each other in many respects. There is therefore no adequate evidence that the true *B. densifolia* has been collected in the West Indies, since the specimens collected by Wright in Cuba and distributed in the Hepaticæ Cubenses under the name *Phragmicoma bicolor* clearly belong to *B. insularis* Evans.³ There still remain, however, a few North American records for the species, based on specimens collected in Mexico, and some of these at least appear to be correctly determined. In South American *B. densifolia* is widely distributed.

10. PTYCHOCOLEUS TORULOSUS (Lehm. & Lindenb.) Trevis.

This South American species, also, is reported by Spruce from Fancy Farm, St. Vincent, under the same number as the preceding species. In the British

¹ Bull. Torrey Club 33: 1. 1906.

² Jour. Linn. Soc. Bot. 30: 336. 1894.

³ Bull. Torrey Club 35: 159. pl. 6. 1908.

Museum a special packet enclosed in No. 343 is labeled *Acrolejeunea torulosa*, the name under which Spruce distributed the species in his exsiccatae. This special packet, in the writer's opinion, likewise contains nothing but *Brachiolejeunea corticalis*. If this determination is accepted there remain no North American records for *P. torulosus*, and the only member of the genus definitely known from north of Panama is *P. polycarpus* (Nees) Trevis., recently described and figured by the writer.¹

¹ Bull. Torrey Club 35: 162. pl. 7, f. 1-11. 1908.

YALE UNIVERSITY

NOTES ON NORTH AMERICAN SPHAGNUM, III

A. LEROY ANDREWS

The Subgenus Inophloea Russow (concluded)

The four species previously treated stand out very definitely and may be considered as taxonomically conclusive; the remaining species of the subgenus are much less understood in their relations on the one hand to *S. palustre*, on the other to each other, as the extensive synonymy of comparatively recent date will readily show. Their foremost common characteristic is found in the chlorophyll cells of the branch leaves, which with a central lumen are usually equally exposed on both surfaces or on neither; there is rarely a greater or exclusive exposure on the inner surface, but the section with the characteristic central lumen shows where the plant belongs. For the rest there is a notable tendency to a reduction of pores in the outer walls of the cortical cells of the stem, in which point as in other minor particulars the remaining species of our group show a somewhat closer relationship to *Litophloea*.

5. *Sphagnum papillosum* Lindberg, 1872. This species is in typical specimens recognizable by the papillose inner walls of its hyaline leaf cells, the papillae being of course confined to the part of the wall immediately overlying the chlorophyll cells. If one is using high magnification with good light, he will note the papillae on viewing the inner surface of the leaf; they are also in evidence in a transverse section, but can be best observed in a longitudinal one. The chlorophyll cells themselves are normally more or less barrel-shaped in section, usually exposed on both surfaces, and have a central elliptical lumen and thick walls. The most essential features of the species were all well brought out by Lindberg in the original short diagnosis.¹ Others were noted by Russow:² the cortical cells of the stem have their fibrils much reduced or almost entirely lacking, the fewer pores (especially often 2) of the outer cortical cells are small, usually round and very clearly defined, as is shown in Braithwaite's plate,³ the stem leaves are relatively broad in comparison to their length and

¹ Contributio ad floram cryptogamam Asiæ boreali-orientalis 280. 1872.

² Zur Kenntn. d. Subsec. u. Cymbif. Gruppe europ. Torfm. 117 ff. 1894.

³ Sphagnaceæ of Europe and North America pl. IV, fig. 9c.

show more frequently a division of some of their hyaline cells; the branch leaves, besides the essential differences mentioned above, have in their broad hyaline cells more numerous and stronger fibrils and generally less pores on the outer surface, the latter from their occurrence in adjacent cell angles giving the impression of a disposal in pairs or threes. All these characters, which are shared by the following species (no. 6), are somewhat variable, so that they do not in any case give sharp diagnostic distinctions, but they are of value as demonstrating cumulatively the really considerable deviation of this and the next species from the others of the group.

The identification of *S. Waghornei* Warnst., 1894, with this species is the result of the examination of two specimens of type material (New Harbor, Newfoundland, 22-5-93) in the herbarium of the New York Botanical Garden. Warnstorf seems himself to have made a similar discovery, for he says in his most recent work¹ that the plant occurred among *S. papillosum* and was used up, apart from a few fragments, in the investigation. That Warnstorf may have failed to note papillæ in his original examination is by no means incredible; that on the other hand a plant or two of *S. palustre* was mixed with his original specimen is not wholly impossible. What there is of his brief description would agree rather better with the latter species. There is no feature in the description nor anything in the plant's habitat to even remotely suggest a separate species.

The species is one of characteristically northern propensities, occurring in Europe and Asia as well as in North America. On the latter continent its range is a fairly definite one, extending from Labrador to New Jersey on the eastern coast, from Vancouver Island to Alaska on the western. Within this area it may be sought in robust, strongly pigmented, brown to nearly black, dull rather than glossy specimens of the *Inophloea* type.

6. *Sphagnum erythrocalyx* Hampe, 1848. This South American species has not previously been accredited to North America, as, generally speaking, the mosses of the two continents seem to have been insufficiently correlated. The first recognition of this as a form distinct among those of North America was by Cardot,² who gave an admirable diagnosis of it, apart from the chlorophyll cell section, as *S. cymbifolium* var. *ludovicianum* Renaud & Cardot, even calling attention to its close correspondence with the description of the South American *S. erythrocalyx*. Warnstorf saw that the form was specifically distinct from *S. cymbifolium* (*S. palustre*) and raised it to specific rank as *S. ludovicianum* (R. & C.) Warnst.,³ where it has, apart from synonyms, remained undisturbed since. My identification of it with *S. erythrocalyx* rests upon a comparison with the type of this species, which I was enabled to see through the kindness of Mrs. Britton and Mr. A. Gepp.

The species differs little from the preceding one, so that Russow was in-

¹ Engler, Pflanzenreich 51: 469. 1911.

² Révision des Sphaignes de l'Amérique du Nord 4. 1887.

³ Hedwigia 30: 161. 1891.

clined to doubt its claim to specific rank.¹ It is, with rare exceptions, a less robust plant; the pigmentation is distinctly reddish brown; the cortical cells of stem (and sometimes of branches) are likely to be even less fibrillose than in *S. papillosum* and show frequently only a single rather large pore per cell; the stem leaves tend to be dimorphous, as Cardot noted, the hemiisophyllous ones very large and fibrillose throughout, sometimes with considerably divided hyaline cells, the others unusually short and small for this group. The branch leaves are frequently broadly rounded at apex, less strongly cucullate than usual in the group, and with correspondingly less resorption of outer membrane in cells near apex of leaf; the chlorophyll cells with thinner walls are often quite rectangular in section, but vary to lenticular, being nearly always exposed on both surfaces. The inner walls of the hyaline cells where overlying these are generally smooth in North American specimens; in Brazil the same or a very closely related species shows papillæ and similar forms may occur with us. I take these to be distinct from *S. papillosum*.

Of the considerable synonymy of the species, which will be greatly increased by South American names, it should be said at the start that Warnstorff's conception of *S. erythrocalyx* has undergone notable fluctuations, due largely to the fact that he had not seen type material until recently.² In 1890, e. g., he made it a synonym of *S. medium* Limpricht, as a variety *papillosum* with papillose inner walls of the hyaline leaf cells,³ only to change his opinion the next year,⁴ though it was still based upon specimens collected by Glaziou, not the type collected by Beyrich. In 1911,⁵ having in the meantime seen type material of *S. erythrocalyx*, he separates from it *S. perichaetiale* Hampe, which he had in 1891 made its synonym, but without in either case having seen the type of *S. perichaetiale*, which was also collected by Beyrich in the same locality as *S. erythrocalyx*. I have been enabled to compare the types of both species but can detect no appreciable difference. The name, *S. perichaetiale*, was apparently suggested by the fact that the plant bore immature capsules immersed within perichaetial leaves.

S. guadalupense Schimper, 1876, from the West Indian island of Guadeloupe is still consistently retained by Warnstorff⁶ as a separate species, but I am unable to see any essential difference in the Guadeloupe specimens, other than their slightly smaller size, a feature characteristic of *Sphagnum* (except *S. portoricense*) from that island. *S. Husnoti* Schimper, 1876, from the same place was reduced to synonymy with *S. guadalupense* by Warnstorff in 1891⁷—it differs only in its paler color and weaker growth,—as was also *S. Guyoni* Warnstorff, 1884, from

¹ Zur Kenntn. d. Subs. u. Cymbif. Gruppe europ. Torfm. 120. 1894; cf. also Cardot, Rév. 5. 1887.

² Cf. Pflanzenreich 51: 516. 1911.

³ Bot. Gaz. 15: 252f, and almost simultaneously Hedwigia 29: 186. 1890.

⁴ Hedwigia 30: 156-158. 1891.

⁵ L. c. 476, 486.

⁶ L. c. 506.

⁷ Hedwigia 30: 148.

Martinique; also *S. Wrightii* Carl Müller, 1887, is now (1911) included under the same species as a variety. This last species was based upon the specimen (no. 1) in Wright's Musci cubenses named by Sullivant *S. cymbifolium*, and its inclusion under *S. guadalupense* was already foreshadowed by C. Müller, who included with it specimens named *S. guadalupense* Schimp. from Guadeloupe.¹ It agrees very well with *S. erythrocalyx*, except that it is not so strongly pigmented, a feature frequent in Cuban specimens of this species. *S. Sintenisii* C. M., 1898, from Porto Rico is retained by Warnstorf,² but the type material in the herbarium of the New York Botanical Garden represents a rather robust specimen of *S. erythrocalyx*, as do also the specimens collected by Heller³ (no. 1339) and by Underwood & Griggs⁴ (no. 949) on the same island. *S. brevicaule* Warnstorf, 1900, from North Carolina is also retained.⁵ This is quite characteristic *S. erythrocalyx*, so far as I can see from examination of the type from the United States National Herbarium. The same applies to *S. Harperi* Warnstorf, 1904, from Georgia, of which I have also seen type, and finally to *S. Earlei* Warnstorf, 1911, from Cuba and *S. Huntii* Warnstorf, 1911, from British Honduras, part of the type of the latter having been kindly sent me by Rev. D. Lillie of Scotland, from whose herbarium it was described. Type material of *S. Earlei* was obligingly furnished me by Mr. H. H. Bartlett. It was collected by Earle in Herradura, Cuba, and seems to me to agree satisfactorily with other specimens collected in the same locality by Baker (no. 4881) and by Mrs. Britton (no. 6650) as well as with that of Wright, already mentioned, and others from other Cuban localities, all of which I have felt obliged to refer to *S. erythrocalyx*. Baker's specimen bears a herbarium name, *S. cubense*, of Warnstorf, which its author seems to have forgotten⁶ Warnstorf describes for *S. Earlei* slightly papillose inner walls of the hyaline cells of the branch leaves where overlying the chlorophyll cells.⁷ These papillæ are but slightly developed and very difficult to make out and to my mind go merely to show the close relationship of the South American forms with and without papillæ

To be Continued

¹ Flora 70: 411. 1887.

² L. c. 474. 1911.

³ Warnstorf has corrupted the name to Steller and retained the phonetic spelling Vega Baha (for Baja), of the label.

⁴ This last less robust specimen, also collected near Vega Baja, is placed by Warnstorf (p. 507) with *S. guadalupense*.

⁵ L. c. 460. 1911.

⁶ The specimen he now includes under *S. guadalupense* var. *Wrightii*.

⁷ L. c. 449. 1911.

REVIEW—A RECENT CONTRIBUTION TO THE ECOLOGY OF MOSSES

L. W. RIDDLE

The Bryophytes are of special interest to the student of plant evolution as being the first group to adopt the land habit. This change from the aquatic habit of the ancestral algae to the land habit of the bryophytes may be looked upon as one of the most critical changes of environment taking place during the evolution of the plant kingdom. It meant, first of all, that the plants must solve the problem of living without a continuous supply of free water, and, furthermore, of resisting, at least in a dormant condition, the periods of drouth which must necessarily occur. As we should expect, the liverworts, with the exception of certain of the higher genera such as *Frullania*, have advanced a comparatively short distance in the solution of the problem, being mostly still confined to wet habitats. But when we come to the mosses, we find a group distributed over a diversity of habitats, and living successfully even under such severely adverse conditions as exist on tree trunks and on rocks, where they are exposed to the drouths of summer and to the freezing temperatures of winter. Any contribution to our knowledge of the ability of mosses to withstand these conditions is welcome.

We, therefore, turn with interest to a recent paper by Irmscher, "On the Resistance of Mosses to Drying and to Cold"¹ containing the results of an investigation carried on at Leipzig, in the laboratory of Professor Pfeffer, our foremost authority on plant physiology. The paper contains twenty-seven tables giving the statistical results of experiments on a variety of mosses, with a discussion of the data thus obtained and a series of conclusions. In order to give the results of Irmscher's investigations to the readers of the *BRYOLOGIST*, a translation of the more important of the conclusions is here given, together with some of the data upon which these conclusions are based.

1. Mosses possess in general a great resistance to continuous desiccation by evaporation of the cell sap. Thus, even a moss of wet habitats, such as *Hypnum aduncum*, required 28 weeks of drying before all of the leaf cells were killed.

2. This resistance, however, varies distinctly according to the habitat to which the particular species has become adapted. This may be illustrated by a comparison of the length of time required to kill the leaf cells of mosses growing on soil and of those growing on rocks and trees.

On soil:	On rocks and trees:
<i>Mnium rostratum</i> 8 weeks	<i>Ulota Ludwigii</i> 50 weeks
<i>Funaria hygrometrica</i> 13 weeks	<i>Orthotrichum speciosum</i> . . . 60 weeks
<i>Catharinea undulata</i> 25 weeks	<i>Racomitrium canescens</i> . . . 60 weeks
While the remarkable fact appears that after 128 weeks (nearly two and one	

¹ Edgar Irmscher. Ueber die Resistenz der Laubmoose gegen Austrocknung und Kalte, *Jahrbücher für wissenschaftliche Botanik* 50: 387-449. 1912.

half years) of continuous drying, some of the leaf cells of *Grimma apocarpa* still remained alive.

3. Furthermore, the drouth-resistance within the species fluctuates according to the water-content of the habitat, becoming adjusted to this water-content through the adaptability of the protoplasm. Thus *Bryum argenteum*, when cultivated in damp air resisted 8 weeks of drying, while the same species cultivated under submerged conditions succumbed in 6 weeks. Still more instructive, however, is the case of species that have grown naturally in different habitats. A striking example of this is seen in *Hyponum aduncum*, where it was found that specimens of a terrestrial form remained alive in part after 20 weeks of drying, while specimens of an aquatic form were killed after 4 weeks.

4. On account of the habit of growth of many mosses in cushions or thick mats, a reduction of the evaporating surface is attained and a consequent retardation of the loss of water during times of drouth. Thus after 18 weeks of drying *Ceratodon purpureus* remained alive if in mats, but was killed if the shoots had been separated.

5. In contrast to a continuous dry period, alternate drying and wetting injures the moss protoplast relatively quickly. For instance, *Bryum capillare* was killed after 10 such alternations.

6. The protonema appears to have a power of drouth-resistance similar in character and amount to that of the leaf cells.

7. The great importance of the calyptra in protecting the young sporogonium is shown by the following comparison:

	with calyptra	without calyptra
<i>Dicranum fuscescens</i>	16 weeks, alive	5 weeks, dead.
<i>Mnium hornum</i>	10 weeks, alive	4 weeks, dead.
<i>Barbula muralis</i>	25 weeks, alive	6 weeks, dead.
<i>Funaria hygrometrica</i>	10 weeks, alive	2 weeks, dead.

8. The determination of the minimum temperature for moss shoots shows that most species resist a temperature of 10° C. (+14° F.) without evident injury, and that the freezing point for the leaves of most species is above -20° C. (-4° F.). At -30° C. (-22° F.) the most resistant species were killed.

9. The freezing point varies according to the temperature prevailing at the time of growth, whence we may conclude that there is a direct adaptability of the vegetative structure to temperature. *Funaria hygrometrica*, when cultivated at +20° C. was partially killed at -5° C.; while material collected out of doors in January was not completely killed even by a temperature of -15° C.

10. The growing points of the moss shoots and the basal cells of the leaves are far superior to the ordinary leaf cells in drouth-resistance and in cold-resistance, and through their regenerative power, after the new intake of water or the return of higher temperatures, form a new system of shoots or protonemata making possible a renewed existence of the individual moss plant.

11. It is shown that there is a relation between the strength of the cell sap

and the power to resist cold, the significance of this being that freezing tends to draw water out from the cells, while the increase in the strength of the cell sap would tend to counteract this.

SULLIVANT MOSS SOCIETY NOTES

A Correction

Plagiothecium geophilum (Aust.) Grout, was found by me at *Sulphur Lick Springs, Ross Co., Ohio*, about nine miles west of Chillicothe, Ohio, *not* at Yellow Springs, Ohio, as given in Dr. Grout's note on p. 53 of the May BRYOLOGIST.

Ross County, Ohio, is a good hunting ground for bryologists, being much cut up by the Scioto River and numerous creeks, which have eroded the surface into gullies and ravines from a few to several hundred feet deep. The wooded sides of these cuts being too steep for cultivation, remain nearly wild land.

Geologically, it is in the Upper Silurian, and good sections from the Waverly shales down to the Niagara limestone are found in different parts of the county. The forests are entirely deciduous, the soil is clay, and the rocks argillaceous shales and limestone.

H. S. JEWETT, M. D.,

MAY 19, 1912.

Dayton, Ohio.

EXCHANGE DEPARTMENT

(To Society Members Only—For Postage.)

Mr. George L. Kirk, 21 East Washington St., Rutland, Vt.—*Grimaldia fragrans* (Balb.) Corda.

Dr. George H. Conklin, 1204 Tower Ave., Superior, Wis.—*Lophozia heterocolpa* (Thed.) M. A. Howe and *Scapania irrigua* (Nees) Dumort. From the Duluth-Superior district.

Edward B. Chamberlain, Round Pond, Maine.—*Hypnum hamulosum* B. & S. c. fr., and *Pseudoleskea radicata* (Mitt.) Kindb.—Collected in Norway by Dr. I. Hagen.

Miss Caroline C. Haynes, Highlands, New Jersey. *Marsupella emarginata* (Ehrh.) Dumort., Adirondack Mts., collected by C. C. Haynes, *Jung. atrovirens* Dumort. Washington, collected by Dr. Frye.

Mr. Geo. B. Kaiser, 564 Locust Ave., Germantown, Pa.—*Andreaea crassinervia* Bruch. Collected in Washington by Prof. T. C. Frye.

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SEPTEMBER 1912

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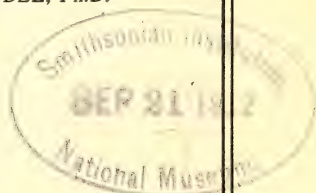
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CONTENTS

Notes on North American Sphagnum III (<i>Concluded.</i>)	
	<i>Dr. A. LeRoy Andrews</i> 70
Molendoa Tenuinervis Limpr. in America Arctica	
	<i>Dr. I. Györfy</i> 75
New or Rare Californian Lichens	<i>Albert W. C. T. Herre</i> 81
Exchange Department	87

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No. 5

NOTES ON NORTH AMERICAN SPHAGNUM, III

A. LeROY ANDREWS

The Subgenus Inophloea Russow (concluded)

S. erythrocalyx collected by Underwood in the vicinity of Cinchona in Jamaica, one of which (no. 160) was named by Warnstorf *S. medium* Limpr. and evidently forms the basis of Warnstorf's assignment of this species to Jamaica,¹ but *S. medium* Limpr. is not found in the West Indies. The second (no. A) Warnstorf named *S. meridense* var. *versicolor*² and still refers to this species.³

With these reductions and corrections the distribution of *S. erythrocalyx* is largely indicated. Its most northerly stations are in New Jersey, where it was collected by D. C. Eaton at Quaker Bridge and Pleasant Mills and distributed in *Sphagna boreali-americana exsiccata* (Eaton & Faxon) as nos 171 and 172. From there southward it is found along our Atlantic and Gulf coasts to Louisiana and throughout the West Indies, where it is the prevailing species of *Inophloea*, in fact the only one yet found except *S. portoricense* and *S. imbricatum*. The locality in British Honduras (leg. F. M. Hunt, 1910) is the only one from Mexico and Central America and similarly in South America it seems primarily a species of the eastern part of the continent, being remarkably abundant in Brazil. Within the range indicated it may be sought in relatively small, compact plants with short branches, showing, if pigmented, a reddish or purplish brown color, which may even be quite dark. The plants are dioicous and rarely found with fruit.

7. *Sphagnum magellanicum* Bridel, 1798. In restoring this venerable and eminently fit name I realize that I stamp myself as a "fanatique de priorité,"⁴ but the discovery by Camus of the identity of Bridel's species seems to me a great gain in view of the considerable synonymy of the species prior to Limpricht's rediscovery of it and of the difficulties naturally associated with old names, which can not always be solved so simply. Nor can I see that Limpricht's credit for having "appreciated" this species⁵ is one whit diminished by

¹ Zur Kenntnis der Subsecundum-und Cymbifoliumgruppe 123ff. 1894.

² L. c. III. 1911.

³ L. c. 489. 1911.

⁴ Cf. Cardot, Répertoire sphagnologique 327. 1896. The re-echo of Cardot's anathema by Warnstorf (Kryptogamenflora der Mark Brandenburg I: 338. 1903.) is interesting in view e. g., of Warnstorf's acceptance just four pages before (334) of *S. subbicolor* Hampe, 1880, instead of *S. centrale* Jensen, 1896. I had supposed that priority was a generally accepted nomenclatorial principle. If it be necessary that a first description furnish the ultimately distinctive character of a species one can not but wonder what species of mosses would retain their names, and who is to pass judgment as to the adequacy of a description. Compare also the very pertinent remarks of Lindberg (Europas och Nord Amerikas Hvitmossor, p. 41f.) à propos of *S. compactum*.

⁵ Bot. Centralbl. 7: 313. 1881.

calling it *S. magellanicum* Bridel. Limpricht got his diagnostic characters from the leaf-section, noting that the chlorophyll cells were central and quite included by the hyaline ones, which is its most conspicuous feature. For its other characters we must turn again to Russow.¹ The pigmentation, a clear purplish red, is unique for *Inophloea*, but the plants may be green or even brownish. The cortical cells of stem show fibrils and one or two good sized pores per cell. The stem leaves are very long and narrow for *Inophloea*, often twice as long as wide, and while normally without fibrils have their hyaline cells practically never divided. The branch leaves are usually short in comparison with width, often nearly orbicular, their hyaline cells are small and narrow, especially as compared with those of the last species, with fewer thin fibril-bands. The pores on their outer surface are conspicuous because the cell-walls are here not at all or only slightly convex. In section this lack of convexity of walls of hyaline cells on either surface is striking, giving with the small elliptical included chlorophyll cells an unmistakable clue to the plant's identity. Unfortunately this character is somewhat variable, as Russow recognized Anschliephacke had already noted,² so that mutually approaching forms of this species and *S. palustre* have caused a deal of trouble.³ This trouble has been increased rather than diminished by the attempt to intercalate a species between the two. The attempt finds its present expression in Warnstorf's *S. subbicolor* Hampe, the stumbling-block of anyone who seriously attempts to secure an understanding of this group of *Sphagnum*. Hampe seems not to have foreseen just what the characters of his species would prove to be and the trouble begins in 1887 with Russow's *S. palustre* subsp. *intermedium*,⁴ which remained a *nomen nudum* until Warnstorf⁵ made it a variety of *S. papillosum*, having in mind the forms of the latter species with reduced or rather entirely lacking papillæ. Russow showed in 1894⁶ that his plant was not immediately related to *S. papillosum* and characterized it at length as *S. intermedium* Russow. A previously existing *S. intermedium* Hoffmann rendered the name objectionable, so in 1896 Jensen⁷ rechristened it *S. centrale* Jensen. Limpricht in 1901⁸ suggested the identity of *S. subbicolor* Hampe, 1880 with such forms and this last name has accordingly since been used by Warnstorf. Limpricht himself took little stock in the species, speaking of it as a second or third class one, which is. I take it, equivalent to none at all. He also speaks of it as being a conglomerate of aber-

¹ *S. meridense* belongs to the group *Acutifolia*!

² Die Torfmoose der thüringischen Flora 10f. 1882.

³ Cf. especially Dusen, Om Sphagnaceernas Utbredning 10. 1887; also Russow, Zur Anatomie der Torfmoose 32. 1887.

⁴ Über den gegenwärtigen Stand seiner Studien 312. 1887.

⁵ Hedwigia 30: 160. 1891.

⁶ L. c. 108 ff.

⁷ Bihang till kgl. sv. Akad. Handl, 21. III: No. 10: 34.

⁸ Kryptogamenflora, Laubmoose 3: 605f. Cf. C. Jensen, Musci Asiae borealis, 3: 6. 1909. Jensen takes it that Limpricht had not seen Hampe's specimen. I do not know that there is any reason to distrust Braithwaite's identification of *S. subbicolor* with *S. papillosum* (Journal of Botany 19: 116. 1881). He stated he had received an authentic specimen from Rehmman.

rant forms of the three species: *S. cymbifolium*, *S. medium*, *S. papillosum* which is true of the last only in so far that forms of *S. papillosum* with weak or no papillæ might very easily be confused with it. That it combines forms of *S. palustre* (*S. cymbifolium*) and of *S. magellanicum* (*S. medium*) is the conclusion which I have also reached and appears to coincide with Russow's original conception (1887) of the relation between these two species.¹ Apart from the fact that Russow's detailed description of *S. intermedium* includes no features that do not belong to the one or the other of the two species in question one need but consult Warnstorf's figures² of leaf-sections of the European species of *Inophloea* to be convinced of the real nature of his *S. subbicolor* Hampe. In his figure 3 are given three sections (a, b, c) of branch-leaves of *S. subbicolor*, which may be compared with those preceding of *S. cymbifolium* (fig. 2a, b, c, d, e) and those following of *S. papillosum* (fig. 4a, b) and *S. medium* (fig. 5). Certainly nothing but extreme "Haarspalterei" can make any distinction between 3a and the various forms of 2, nor is there a much greater difference between 3c and 5, while that between 3a and 3c is infinitely greater than either. My conclusion then is, and all the facts that I have observed seem to confirm it, that *S. subbicolor* as understood by Warnstorf is an artificial species, attempting to embrace intergrading or apparently intergrading forms of two very closely related species. The conception implied in Jensen's name, *S. centrale*, applies rather to the aberrant forms of *S. magellanicum*, which species alone of *Inophloea* Jensen found in the station from which he first recorded *S. centrale*. Such variation of *S. magellanicum* involves only a slight thickening of its cell walls at their junction. In the summer of 1904 I had the pleasure of meeting Herr Warnstorf in Neu-Ruppin and expressed to him on that occasion my inability to form any satisfactory conception of *S. subbicolor*. He very kindly gave me a local specimen for comparison, but this specimen agrees so closely with *S. magellanicum* that one can refer it to it without a qualm of conscience, in fact I do not see how one can well dispose of it otherwise. With careful study of their aggregate characters I think these forms can in all cases be referred satisfactorily to one or the other of the two species and that the two (*S. palustre* and *S. magellanicum*) are specifically sufficiently distinct. Facts of distribution would tend to confirm this conclusion, e. g., the fact that *S. magellanicum* is widely distributed in South America, where *S. palustre* (and it may be added, *S. subbicolor*) does not occur.

S. pseudomedium Warnstorf, 1891, originally accredited to Central America, its author has now ascertained³ to have come from Australia or New Zealand or thereabouts, where *S. magellanicum* also occurs.

Our species is widely distributed in North America: from Labrador southward to Florida and Alabama, in Michigan and Minnesota, from California northward to Alaska. It is entirely lacking in the West Indies, but occurs

¹ Cf. also Loeske, Zur Morphologie und Systematik der Laubmoose 46. 1910.

² Kryptogamenflora der Mark Brandenburg 1: 343. 1903.

³ Pflanzenreich 51: 486. 1911.

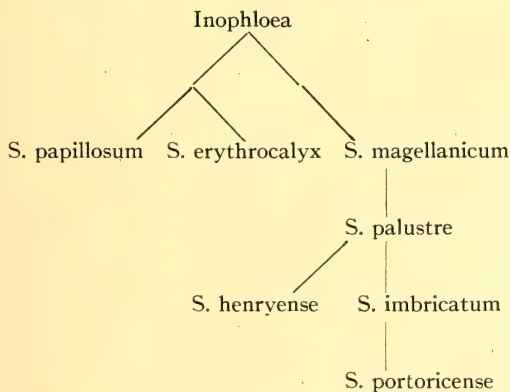
in Bermuda, where it is the only species of *Inophloea*. It has not yet been found in Mexico or Central America, though in South America it is a characteristic and abundant species of the whole Andean region to Cape Horn, being the only species of *Inophloea* in the region of the Magellan Straits. It is also of wide distribution in Europe, Asia and Australia, in fact by far the most widely distributed species of *Inophloea*. Its characters are also uniform throughout its range, apart from the tendency to vary in the direction of *S. palustre*. Within its North American range it may be sought under a variety of conditions and will best be recognized in the field by its purplish red pigmentation. It is dioicous, but occurs frequently with fruit.

To what has been said of the individual species of *Inophloea* there may be added that the corrugated condition of the inner walls of the cortical cells where these overlie the wood-cylinder as described for *S. imbricatum* and *S. portoricensis* is entirely analogous to the "fringe-fibrils" of the inner walls of the hyaline cells of the leaves where these overlie the chlorophyll cells and that the two are evidently merely different phases of one and the same phenomenon; further that I was able to confirm Austin's statements about the habitat of *S. portoricensis* by observations made during a short stay at Island Heights in New Jersey in the early part of August 1911. In the shallow pond just southeast of the Pennsylvania Railroad station at Toms River *S. portoricensis* may be found in abundance, submerged entirely or with the tops of the plants just reaching the surface of the water. No *S. imbricatum* was noted in this locality, nor was there any suggestion of forms varying in the direction of that species. The water in which the plants grew was tepid or distinctly warm to the hand and abundance of bog-iron ore accounts, at least in part, for the dark color the plants usually show. Associated with the species were *S. cyclophyllum* and *S. Pylaesii* with occasional *S. subsecundum*. With these conditions so favorable for southern species the narrow border of cranberry-bog (*Vaccinium macrocarpon*) offered a decided contrast, the prevailing species being here *S. pulchrum*, which finds its southern limit in New Jersey, and *S. magellanicum*, a tuft of *S. papillosum* being also found. It was here an easy matter to stand with one foot in boreal and the other (wetter one) in subtropical Sphagnum. With what has been said about this pond the reader may compare Austin's description¹ of conditions in Manchester (now Lakehurst), N. J. and be assured that watercourses in the pine-barrens of New Jersey constitute one of the best localities for Sphagnum in North America.

Phylogenetically the order of species in *Inophloea* should be the reverse of that in the above notes. The reasons for regarding *S. magellanicum* and the collective *S. papillosum* and *S. erythrocalyx* as heading the line of development are, apart from their much broader distribution, certain anatomical features. In the first place the central position of chlorophyll cells in leaf-section appears to be a primitive condition in *Sphagnum* generally, as shown by the morphologic

¹ Amer. Journ. of Science and Arts (Silliman's Journal), 2nd ser. 35: 252ff. 1863.

fact that in immature condition all *Sphagnum* leaves are thus characterized.¹ For the mature leaves the feature occurs in some species of all groups of the genus, either as the normal condition of the group or as that of the first phylogenetic species or rarely perhaps as a tendency of reversion. Furthermore in the lesser number of fibrils in cortical cells and of pores in outer cells of stem, as well as of pseudostomata in the wall of the capsule these species approach more closely those of the other subgenus. My conception of the phylogenetic relations of our species of *Inophloea* could be expressed by the following diagram:



My reason for putting *Inophloea* before the two sections of *Litophloea* is the conviction that it is relatively nearer the primitive type of *Sphagnum*, as shown by its leaf structure without differential margin, the less differentiated branch-cortex, etc. Even the fact that the cortical cells are fibrillose argues for a more primitive condition of things, as these cells are quite analogous to the hyaline cells of the leaves, which are normally fibrillose in all the groups. Warnstorf has reversed this natural order in his treatment in *Pflanzenreich* without giving any reasons for doing so. He had in *Die natürlichen Pflanzenfamilien* (1900) followed an order with which my own is in essential agreement. The species of *Inophloea* seem also to be relatively older in their separation from each other than those of some of the other groups, notably of the *Acutifolia*, whose macroscopic differences, though encouraging in the field, are more truly varietal in their nature.

ITHACA, N. Y.

¹ Cf. Russow, *Zur Anatomie der Torfmoose*, 21. Russow's observations (*Zur Kenntnis der Subsecundum- und Cymbifoliumgruppe* 124) on the chlorophyll cells of the leaves of pendent branches I am unable to confirm, nor do I find otherwise any clear characters of reversion in these branches or their leaves.

MOLENDOA TENUINERVIS LIMPR. IN AMERICA ARCTICA. ·

AUCTORE: I. GYÖRFFY, LÖCSE, HUNGARY.

(With Plate III.)

Ill. ac cl. dominus, bryologus americanus Dr. A. LeRoy Andrews, cum diversas species generum *Aschismae*, *Astomi*, *Hymenostomi*,—*Molendoe* et *Euccladii* ex America revidendi causa rogatus est, inter alias scripsit: "and the plant now passing as *Molendoe tenuinervis* Limpr., as these are undoubtedly more widely distributed in North America than present collections would indicate."¹ Mr. A. LeRoy Andrews recte dixit, nam *Molendoe tenuinervis* in North America crescit.

Anno 1911, 5. x., misit mihi ill. ac doct. dominus Gallicus bryologus Prof. Dr. Jules Cardot (Charleville) cognoscendi et in monographia mea—qua scribenda² jam abhinc 5 annos occupatus sum³—communicandi causa unum muscum, cuius scheda ita sonuit: "Herb. J. Cardot. *Molendoe tenuinervis*, Limpr. (*Gymnostomum laeve* Bryhn) Amer. arct. Ellesmere Land, Beistadfjord, lat. sept. circiter 79°, mense Junio anni 1899 legit Herm. G. Simmons.—Ex. herb. Bryhn."

Ipse in hoc exemplari *Molendoam tenuinervem* exemplo cognovi et meum microscopio accuratissime consummatum examen spectationem hanc sine ulla dubitatione confirmavit. Postea cum maxima obstestatione ab ill. ac cl. domino Dr. N. Bryhn (Hönefoss) oravi, ut mihi exemplaria omnia *Gymnostomi laevis*⁴ ex America arctica publicata cognoscendi causa benevole mittere, gratus esset.

A domino Dr. Bryhn continuo accepi plurima exemplaria *Molendoarum tenuinervium* arcticarum,—ideo ill. ac cl. dominum Dr. Bryhn cum maxima reverentia saluto, ei maximas ago gratias, ejusque singularem benevolentiam semper in animo habebo.

Ita occasionem habui exemplaria e plurimis stationibus⁵ adhuc publicata censere. Omnia exemplaria *Molendoe tenuinerves* erant, et quidem partim *fo. pl. arcticae* partim *fo. xerophila*. Inferius descriptionem brevem *Molendoe tenuinervis* e regione arctica Americae ortae dabo.

¹ THE BRYOLOGIST 15. 1912. Cover for January.

² cf. Rev. Bryol. 38: 20-21. (1911.)

³ Opus meum titulum habet: Tentamen monographiae generis *Molendoe*.

⁴ N. Bryhn: Bryophyta in itinere polari Norvagorum secundo collecta. Report of the second Norwegian Arctic Expedition in the Fram, 1898-1902. No. 11. Kristiana, 1907: 53. Tab. I, Fig. 1.

⁵ Ex herb. Bryhn: No. 3884, 3889, Kong Oscars Land. Jdre Gassefjord (Falkberget), 13-6, 1902—No. 2800, Kong Oscars Land, Gassefjord (Galgeodden) 24-6, 1901.—No 1992, Kong Oscars Land, Havnefjord, 11-6, 1900.—No. 3204, Kong Oscars Land, Exkrementbugten 6-7, 1900. Ex herb. Cardot; Ellesmere Land, Beistadfjorden, lat. sept. circ. 79° (No. 577.). Ita censui exemplaria nulla solum e statione North Kent (cf. Bryhn: l. c. 53; Per Axel Rydberg in THE BRYOLOGIST. 11: 80. 1908.)

Caespites densi, 1.2–2 cm, 3–6.2 cm longi, infra fusci, supra atrovirides, leviter dilapsi.

Caulis ramosus, in sectione transversa rotundatus fere semper autem rotundato-triangularis; externe cellulis epidermidis uni-bistratos obiectus, in media parte parenchymatos corticalis cum “funiculo centrali” (Centralstrang) (Plate III, fig. 2). Mensuram cellularum caulis vide in tabella I.

TAB. I

“Gymnostomum laeve,” Sectio transversa caulis.		No. 3889 fo. plantae arcticae.	No. 3884 fo. xerophila.
cellulae			
epidermidis	altitudo	5, 8, 10 μ	nullius momenti
	latitudo	6, 8, 10, 13 μ	
parenchymatos corticalis (Rinde)	altitudo	13, 16, 21, 24 μ	
	latitudo	10, 13, 16 μ 18, 21, 24 μ	
funiculi centralis (Centralstang)	altitudo	1.5, 2, 4, 5 μ	
	latitudo	1.5, 2, 4, 5 μ	
tota diametros caulis in sectione transversa.		170, 204, 221 μ	170 μ , 221 μ , 255 μ , 272 μ .

Folia humida erecte distantia “e basi ovato in apicem breviorē lanceolatum et obtusum subito angustata”—uti Dr. Bryhn bene descripsit (Plate III, fig. 3–7).

Costa sub apice evanida—non excurrens. Mensuram foliorum dat in conspectu tabella II.

TAB. II

"Gymnostomum laeve."		No. 3889. fo. pl. arcticae.	No. 3884 fo. xerophila.	fo. xerophila. Beistadfjord ex herb. Cardot.
latitudo foliorum	supra	102, 119, 153 μ	136, 170 μ	102 μ
	media parte	255, 306, 340, 347 μ	289, 340, 425 μ	325 μ
	infra	340, 391, 476, 493, 510 μ	510, 544, 561, 595, 612 μ	459 μ
longitudo foliorum		0.935, 1.020 mm. 1.156, 1.190 mm. 1.275, 1.360 mm.	0.850, 0.867 mm. 0.935, 1.105 mm. 1.190 mm.*	0.646 mm. 0.680 mm. 0.697 mm.
latitudo costae	supra	34, 42 μ		
	media parte	51, 59, 68 μ	51 μ	51, 68 μ
	infra	59, 68, 85 μ	68 μ	42, 51, 68 μ

* Cum asteribus sunt rari casus adnotati.

Costa in sectione transversa structuram sequentem demonstrat. In parte folii basim versus (Plate III, fig. 9) "duces" (5), fasciculo inferiore (6), et superiore (4), stereidarum et utrumque cellulis epidermidis obtecti et quidem cellulis ventralibus (2) dorsalibusque (3). Saepius (Plate III, fig. 8) fasciculus superior stereidarum (4) vix, et fasciculus inferior bistratose (6) explicatus. In media parte foliorum (Plate III, fig. 10) fasciculus superior stereidarum (4) *semper adest*. Mensuram cellularum costam formantium vide in tabella III.

TAB. III

“Gymnostomum laeve,” in sectione transversa folii.			No. 3889. fo. pl. arcticae.
cellulae	ventrales	latitudo	9, 13, 18, 22 μ
		altitudo	9, 13, 18, 22 μ
	dorsales	latitudo	6, 9, 11, 13 μ
		altitudo	6, 9, 13 μ
	duces	latitudo	13, 18, 20, 22 μ
		altitudo	13, 18 μ
	stereidae	latitudo	2, 4, 6 μ
		altitudo	2, 4, 6 μ
	laminares	latitudo	9, 13, 18, 22, 27 μ
		altitudo	9, 13, 22, 27, 31 μ *
	marginales	latitudo	9, 11 μ
		altitudo	9, 11 μ

Lamina in parte inferiore folii et in sectione transversa unistratosa (Plate III, fig. 8 i.) et cellulae laminares laeves, raro aliquibus papillis praeditae. *In media parte folii* (Plate III, fig. 10) jam lamina locis pluribus *bistratosa* (Plate III, fig. 10. i.); in universum: *apicem versus tota lamina bistratosa*. Papillae saepius inveniuntur. Cellulae laminares in aspectu superficiali in parte inferiore folii longiusculae, polygonales (Plate III, fig. 12), media parte tri-quadrangulares fere semper latiores quam longiores (Plate III, fig. 11.). Mensuram cellularum laminarium vide in tabella IV.

* Cum asteribus sunt rari casus adnotati.

TAB. IV

"Gymnostomum laeve" cellulae laminae in superficiali aspectu.		No. 3889. fo. pl. arcticae.	No. 3884. fo. xerophila.
in inferiore parte folii.	longitudo	22*, 27, 31, 36, 40 45, 49, 54, 58 μ	22, 31, 36, 40 μ
	latitudo	9, 11 μ	11, 13, 18 μ
in media parte folii.	longitudo	9, 11, 15 μ *	9, 13 μ
	latitudo	6,* 9, 13, 15, 18 μ	13, 18, 22 μ
in superiore parte folii.	longitudo	9, 11, 13 μ	
	latitudo	9,* 13, 18 μ	

Exemplaria omnia a me visa feminea fuerunt. Flores feminei lateribus caulis insident aut solitarii (Plate III, fig. 13), aut—et tum jamque ramosi sunt—bini (Plate III, fig. 14), aut pluraliter (cum 3-5 numero).

Planta arctica differt ab aliis formis *Molendoe tenuinervis* forma *foliorum papillis parvis*, lamina in superiore parte foliorum bistratosa, foliis minoribus; ideo secerno exemplaria arctica, et fo. *plantae arcticae* nomino.

Forma altera plantae arcticae est, fo. *xerophila*, quae differt ab omnibus formis *Molendoe tenuinervis*: foliis minimis et latioribus (vide tabellam secundam), in caule squammatim (Plate III, fig. 1)—et saepius perparce insidentibus a forma pl. arcticae *papillis numerosis laminam* (exclusive partem inferiorem) *obtectis*.

Resultata comparativa et descriptionem plenam in lucem daturus sum in opere meo "Versuch einer Monographie der Gattung *Molendoe* (Tentamen monographiae generis *Molendoe*)"—multas tabulas cum pluribus centum figuris originalibus adjungens.

EXPLICATIO TABULAE III.

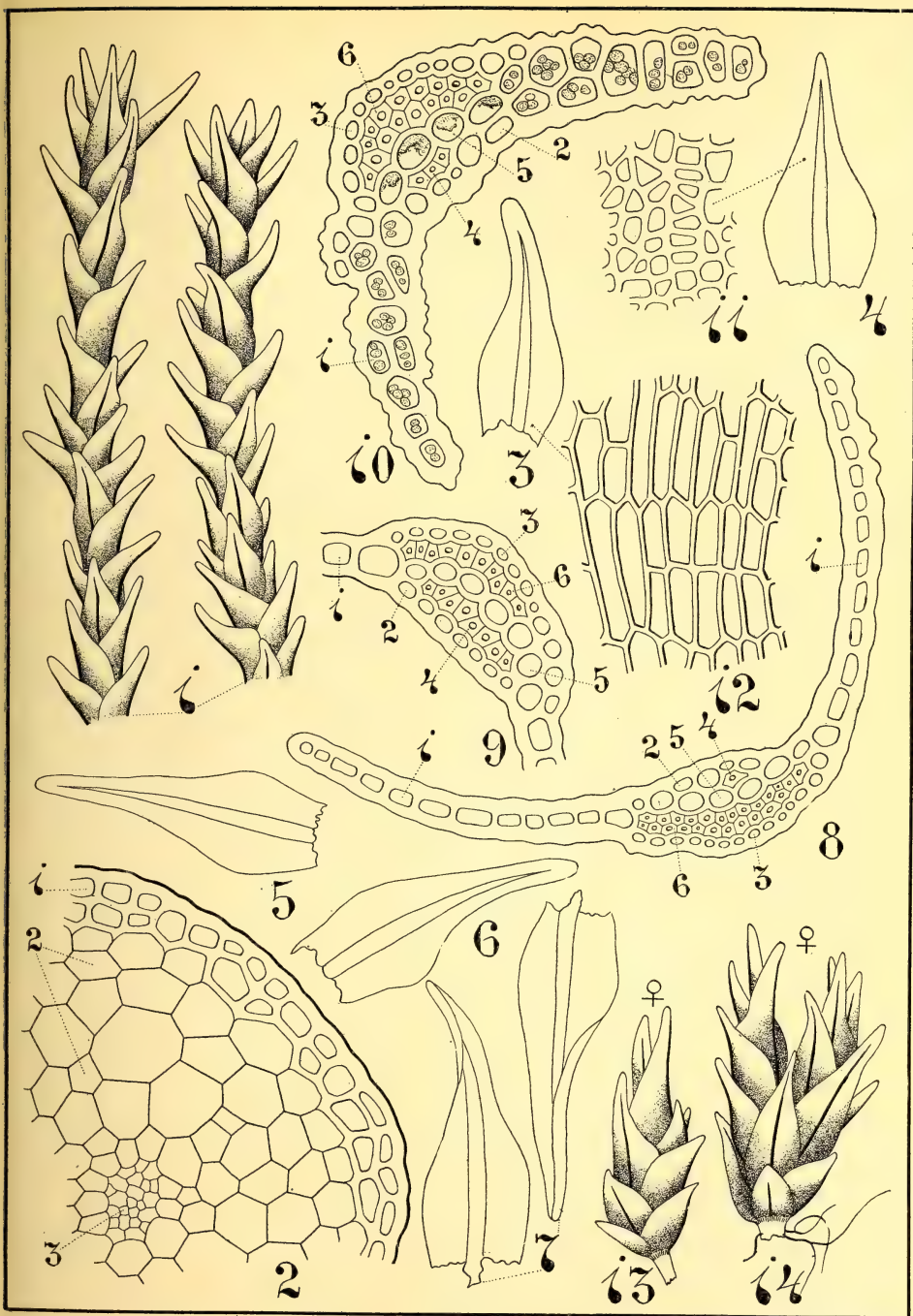
Fig. 1. *Molendoe tenuinervis* fo. *xerophila*. Pars supra caulis madidi (No. 2800, Gaasefjord, leg. Herm. G. Simmons, ex herb. Dr. Bryhn, sub nom. "*Gymnostomi laevis*") $\times 16$.

Molendoe tenuinervis fo. *plantae arcticae* (No. 3889. Gaasefjord, leg. Herm. G. Simmons, ex herb. Dr. Bryhn, sub nom. "*Gymnostomi laevis*"). F 1.

Fig. 2. Sectio transversa caulis; (1) cellulae epidermales, (2) parenchyma corticalis, (3) funiculus centralis $\times 215$.

Fig. 3-7. Folia caulina madida $\times 16$.

* Cum asteribus sunt rari casus adnotati.



del. Gyórfy, 1912.iv.

Fig. 8. Sectio transversa e basali parte folii: (1) cellulae laminares, (2) c. ventrales, (3) c. dorsales, (4) c. strati superioris librorum, (5) duces, (6) c. strati inferioris librorum $\times 215$.

Fig. 9. Sectio transversa nervi e parte media folii; (1) - (6) uti apud figuram 8.

Fig. 10. Sectio transversa e superiori parte folii; (1) c. laminares grana chlorophylli multa habentia, (2) - (6) uti apud figuram 8 $\times 215$.

Fig. 11. Cellulae laminares e media parte folii in spectatione superficiali $\times 215$.

Fig. 12. C. laminares e basali parte folii in superficiali spectatione $\times 215$.

Fig. 13-14. Flores feminei $\times 16$.

NEW OR RARE CALIFORNIAN LICHENS.

ALBERT W. C. T. HERRE.

To the student of lichens in one of the Atlantic seaboard states, it would seem that the lichen flora of California must be well known and thoroughly worked out. Yet such is not the case. Excepting the region within 75 miles of Los Angeles, and the Santa Cruz peninsula, no section of the state has been thoroughly worked. Such is the diversity of topographical and climatic conditions, that twenty miles from the Santa Cruz peninsula, in the dry Inner Coast Range, we come upon a lichen flora which presents many striking divergencies from that previously studied by me in the peninsula. Not only are there many problems of distribution to be worked out in the counties lying between the ocean and the Sacramento Valley, and in the region about Mount Shasta and the other peaks of northeastern California, but there are still many remarkable new species to be discovered. The large foliose and fruticose lichens of the state are fairly well known, and no new species of these are to be expected, though a number occur which are known only from other parts of the country. Among the rock lichens of obscure habit but little work has been done, and a careful study of the rock lichens of any cañon in the Inner Coast Range of the northern part of the state will be rewarded by many rare finds. Especially should the calcareous rocks be studied, as but very little attention has been paid to their lichens.

The following lichens are a few to which I wish to call the attention of students of our western species. I have collected most of them in various parts of the state, while a number have been recognized while studying the undetermined miscellaneous lichen collections in the herbarium of the University of California.

I reluctantly describe any species, however well marked, as new, and those herein given are but a small part of the number set aside in my herbarium as different from any described in the accessible literature or exemplified in the published exsiccata.

EVERSON, WASHINGTON.

POLYBLASTIA INTERCEDENS (Nyl.) Lonnr. Flora **41**: 630. 1858.

Verrucaria intercedens Nyl. Expos. Synop. Pyrenocarp. 33. 1858.

Thallus indeterminate, thin, uniform, microscopically fissured, greenish-yellow or olivaceous; no chemical reactions. Apothecia small to minute, .4 to .9 mm. in diameter, conical, almost completely immersed, the epithecium appearing as a minute dark speck at the apex; perithecium entire, yellowish brown; amphithecium pale; paraphyses none or scanty when present, simple, thread-like, and twining; asci elongate-cylindrical, 14 to 16.4μ broad and 68.4 to 82μ long; asci and spores yellow-brown with I; spores colorless, muriform, oblong, 9 to 12μ broad and 18 to 30μ long; longitudinal rows of cells 2 to 4, the transverse series 6 to 10.

Known to occur only on sandstone at Alum Rock Park, in the Mt. Hamilton range. Altitude about 150 meters.

Trimmatothele umbellulariae Herre, sp. nov.

Thallus very thin, forming a grayish dusky effuse patch very obscure and not affected by reagents. Apothecia exceedingly minute, .1 to .3 mm. in diameter, black, conical or hemispherical, the apical pore visible only with a strong lens; perithecium dimidiate, black; paraphyses wanting, asci not plainly evident; spores exceedingly numerous, simple, oval or short ellipsoid, colorless, becoming yellowish with I, 2 to 2.5μ broad and 2.5 to 3μ long.

On bark of living *Umbellularia californica*, in the hills of Berkeley; altitude about 125 meters. The specimens of this almost unnoticeable lichen are very scanty. Type in the author's herbarium.

CHAENOTHECA PHAEOCEPHALUM (Turn.) Th. Fr. Nov. Act. Soc. Aps. III. **3**: 351. 1861.

Lichen phaeocephalus Turn. Trans. Linn. Soc. Lond. **8**: 260. pl. 6, f. 1, 1807.

Chaenotheca phaeocephala Fink. Contr. U. S. Nat. Herb. **14**: 49. 1910.

Thallus of minute, gray, ashy, or yellowish green granules which are more or less congested, rarely larger and more or less squamulose, with an almost crenate margin. Stipes usually slender, short, .75 to 2. mm. in height, blackish brown, rarely branched and bearing 2 or 3 apothecia, sometimes clustered or a number arising from a common point; apothecia small, .2 to .8 mm. in diameter, top-shaped, the summit flat or slightly convex and more or less yellow or greenish-yellow pruinose, rarely brown; hypothecium dark brown; thecium pale below, very pale brown above; paraphyses simple or sometimes branched, slender, sinuous; asci imperfectly made out, very slender, cylindrical, soon deliquescent; spores simple, spherical, brown, at first nearly colorless, 2.75 to 5μ in diameter.

Rare; on an old redwood post in the Oakland Hills; at an altitude of about 175 meters. In the University of California herbarium, from Sonoma county, collection of F. T. Bioletti. Recorded by Tuckerman from New Bedford, Massachusetts, and from Canada; from Minnesota by Bruce Fink, and from the Rocky Mountains and from Vancouver Island by J. M. Macoun.

CALICIUM HYPERELLUM Ach. Meth. Lich. 93. 1803. Tuck. Genera Lich. 241. 1872. Macoun, Cat. Can. Plants, Part VII. 172. 1902.

Thallus effuse, lemon or greenish yellow, granulose to scurfy, thin and scattering or continuous; in our specimens spreading extensively, but usually forming small, interrupted patches. Apothecia numerous, stipes firm, black, stout, rather short, .5 to 1.3 mm. in height, the head lens-shaped or more or less globose, black, or sometimes slightly reddish or brownish black, .3 to .5 mm. in diameter; hypothecium dusky; paraphyses short, simple, slender; asci 24 to 27μ long, 4 to 6μ wide, cylindrical or slightly bellied; spores small and colorless or nearly so within the asci, when mature blackish, 2-celled, strongly constricted in the middle, ellipsoid or ellipsoid-pointed, 4.5 to 5.5μ broad and 9.5 to 13.6μ long.

Here described from specimens in the University of California herbarium, marked "State Survey." They were probably collected in the Yosemite in 1867, on the bark of *Abies*. This plant is common and widely distributed in Europe, but is rare and almost confined to the Pacific slope in America, though recorded from Newfoundland by Macoun. As it is recorded by Tuckerman from the Yosemite and the Big Trees, and by Dr. Hasse in a manuscript list of the lichens of southern California, as well as by Macoun from Vancouver Island. It beyond doubt occurs in the higher mountains of the Pacific slope, from the Mexican boundary to British Columbia.

ARNHONIA POLYGRAMMA Nyl. Prodr. Fl. N. Gran. 66. 1863.

Thallus small, 1 to 3 cm. in diameter, determinate, uniform, smooth, rather thin but inclined to be thick in places, creamy gray to whitish, becoming brown or yellow with KOH. Apothecia numerous, very irregular in shape, branching or stellate, innate or closely appressed; disk flat, linear, becoming protuberant when moistened, clear red-brown to brown and often slightly gray pruinose; epithecium broad, granulose, dark brown; asci short, broadly clavate, 10 to 15μ by 30 to 38μ ; thecium colorless or very pale yellowish, turning blue with I; spores colorless, 4-celled, ovoid or pointed ellipsoid, one end smaller than the other, 4.4 to 5.8μ broad and 13 to 14.6μ long.

On oaks in Alum Rock park, Inner Coast Range; altitude 150 meters. Described by Nylander from the United States of Colombia. Differs from *A. radiata*, with which it may be confused, in the color of the apothecia and the chemical reactions, as well as by the different appearance of the thallus.

OPEGRAPHIA ABNORMIS Ach. Syn. Lich. 74. 1814.

Thallus forming a thin white or whitish, circular to irregular, small or medium sized film on the bark of living trees, no chemical reactions. Apothecia small and variously shaped, circular, irregularly angulose, and obsoletely stellate; thecium blue with I, the spores yellow; asci broadly top shaped to almost spherical, 21.8 to 24.6μ broad and 27 to 32.8μ long; spores muriform, oblong to pointed ellipsoid, 4, 6, and more commonly 8 in the asci, colorless, with a narrow halo, transverse rows of cells 7 to 9 in number, the longitudinal of 2 to 4 rows, 7.5 to 10μ broad and 14.5 to 20μ long; according to Dr. Hasse the spores are 10 to 12μ broad and 20 to 26μ long.

A tropical lichen described from New Caledonia, Jamaica, and Calcutta. Found on the trunk of a street shade tree (*Acer* sp.), near the Mission in Santa Barbara; altitude 100 meters.

OPEGRAPHIA ATRA Pers. in Ust. Ann. Bot. 7: 30. *pl.* 1, *f.* 2. 1794.

Thallus very thin, forming smooth brownish or yellowish or dusky gray patches, darkened by KOH. Apothecia small, linear, simple, straight, or flexuose, depressed and closely adnate, margin thick; disk a narrow crevice; hypothecium broad, brown to blackish brown; paraphyses short, simple; asci short, more or less top-shaped, with I bluish then vinous red, outer portion greenish; spores colorless, 4-celled, their tips more or less pointed, 4 to 5.5μ broad and 13.75 to 16.4μ long.

On the bark of *Umbellularia californica* in the Berkeley Hills; altitude 100 to 200 meters; not abundant.

TONINIA RUGINOSA (Tuck.) Herre. Proc. Wash. Acad. Sci. 12: 103. 1910.

Lecidea ruginosa Tuck. Lich. Calif. 25. 1866. Syn. N. A. Lich. 2: 64. 1888.

To the description given by Tuckerman, the only one to previously examine this rare lichen, I add the following data: Epithecium thick, very dark violaceous or reddish, almost black, no reaction with KOH; paraphyses simple, free, lax, slender, with enlarged bulbous pale violaceous tips; asci slender, narrowly clavate, 5 to 7μ broad and 30 to 40μ long; hypothecium yellowish to brownish, or in very thin sections quite colorless; thecium blue with I; spores 2 to 8-celled, acicular, $2-3\mu$ broad and $16-23.5\mu$ long.

I have collected this very sparingly on the shaded under side of serpentine ledges in the Oakland Hills, at an altitude of 300 meters. The thallus agrees with Tuckerman's description; but the apothecia average much smaller, while the spores are a great deal shorter, Tuckerman giving their length as from $25-40\mu$. Not known elsewhere.

Heppia alumenensis Herre, sp. nov.

Thallus of medium sized to very small umbilicate, irregular, centrally thickened squamules, which are frequently grouped so as to resemble some small *Collema*, their surface irregular, more or less granulose to verrucose, lobes small, irregular, dingy black or greenish black, under surface a flesh tint, more or less obscured by blackish granules, therefore appearing more or less dusky; alga *Scytonema*, the gonidia globose to oval, 9 to 13μ in diameter; no chemical reactions. Apothecia one to several in a squamule, small, at first subglobose, the disk very narrow and dotlike, later becoming rather broad, disk flat, reddish-brown to concolorous, margin thick, entire; hypothecium clear; paraphyses simple, septate, 2.2 to 4.5μ broad with enlarged, pale yellow tips; fertile asci infrequent, oblong-clavate and ventricose-oblong, 26 to 28μ broad and 68 to 79μ long; thecium blue, then sordid reddish-yellowish with I; spores 16, 20, 24, 32, and very numerous in the asci, colorless, simple, ellipsoid, thin-walled, 2 to 4μ broad and 5.5 to 9μ long, also 3 to 4μ broad and 11 to 12μ long.

On stones at Alum Rock park near San José, and probably occurring in

similar situations throughout the Inner Coast Range. Type in the author's herbarium.

LECANIA ERYSIBE (Ach.)

Lichen erysibe Ach. Lich. Suec. Prodr. 50. 1798.

Thallus crustose, effuse, thin and of crumb-like granules, or of thick, fragile, deeply fissured areoles, with minutely and imbricately lobulate surface, the lobules with crenate margin, sandy-brown and olivaceous; no chemical reactions. Apothecia minute or very small, .3 to 1 mm. in diameter, closely adnate, the flat disk dark red-brown or blackening, margin rather thick, entire, pale, sometimes disappearing; hypothecium colorless; thecium pale below, becoming brownish or reddish above, blue with I, finally turning to greenish; paraphyses thick, more or less jointed or septate, their tips slightly enlarged, colorless or darkened; asci short, clavate; spores ellipsoid, simple or imperfectly 2-celled, 4 to 5.5μ broad, and 10.9 to 14μ long.

Rare; on sandstone in the Oakland Hills, altitude about 400 meters.

Legania shastensis Herre, sp. nov.

Thallus thin, effuse, of thin or thickly scattered, small, crumb-like granules, ashen gray to dusky; KOH yellowish; CaCl_2O^2 . Apothecia numerous, very small to minute, .3 to .8 mm. in diameter, circular, adnate, the flat to slightly convex disk pale yellow to reddish, much like that of *Caloplaca gilva*, thalline margin paler, entire, thin, often disappearing; very small apothecia often have a thicker whitish margin, with darker, pruinose disk; hypothecium broad, colorless; thecium deep blue with I; paraphyses simple, not septate, thread-like, subcoherent, their apices not thickened; asci club-shaped to sub-cylindrical, small, 8– 11μ broad by 36– 44μ long; spores 6 (?) and 8, small, usually bowed but also straight, 4-celled, 3.5 to 5.5μ broad and 11 to 14μ long.

The few specimens known were collected on the bark of *Aesculus* at Stillwater, Shasta county. This deceptive lichen resembles *Caloplaca gilva* externally and is very puzzling in section. The thallus is blackened by a *Scytonema*, and the alga of the lichen is apparently a *Nostoc*, large colonies of which are parasitic within the thallus, while of course *Scytonema* filaments are scattered everywhere. It therefore requires very careful study to demonstrate that the real alga of the lichen is not one of the *Cyanophyceae*.

Type in author's herbarium; cotypes in the herbarium of the University of California and of Dr. H. E. Hasse.

PARMELIA OLIVARIA (Ach.) Hue, Lich. Ex. Eur. 195. 1803.

Parmelia perlata B. *olivaria* Ach. Meth. Lich. 217. 1803.

Thallus more or less orbiculate and dilated, small to medium size, rather loosely attached, the surface smooth, gray-green, lobes rather short, crisp, with flexuous, crenate margin, their thickened tips strongly upward curved, and inward and white soresiate, under surface black with little or no brown margin, minutely wrinkled, naked or with scattered patches of stout black fibrils; KOH yellow, the medulla not affected; surface not affected by CaCl_2O_2 but the medulla tinged red; ours sterile.

On trees, Mission Ridge, Santa Barbara; altitude about 240 meters. Reported by Dr. Hasse from near Santa Monica. Originally described by Acharius from olive trunks in Spain, and widely distributed, though not often recognized by American writers. Probably native to all the southern half of California.

ALECTORIA OREGANA Nyl. Lich. Jap. Obs. II. 104. 1890.

Thallus erect and shrub-like or sub-pendulous, 3. to 5. cm. in height, cespitose and usually forming densely matted clumps so that the length of the plant is not easily determined, slender, weak, irregular, more or less angulose and much contorted, with smooth, shiny epidermis, branches frequent, their tips filiform and pointed, various shades of greenish or reddish brown, basally much paler, the upper portion often much darker, becoming blackish brown; no chemical reactions. Apothecia 2 to 7 mm. in diameter, lateral, sessile, at first circular and concave, but later becoming strongly convex or domelike, disk shining chestnut brown; receptacle roughened, tuberculate, and usually ciliate, the fibrils pointed, not numerous; thecium and hypothecium colorless; epithecium broad, dark brown; asci short, clavate, 23 to 25μ long and 7 to 8.2μ broad; thecium blue with I, and according to Nylander changing to fulvescent, but not so in my material; spores simple, colorless, short ellipsoid to almost globose, 3 to 4.5μ broad and 5 to 6μ long.

Rather common on *Pinus ponderosa*, mingled with *Nephromopsis platyphylla* and *Parmelia enteromorpha*, on Mount Hamilton, Inner Coast Range; altitude about 1200 meters and above. I have also examined material from San Jacinto Mountain, where it occurs at an altitude of 1540 meters on *Pinus ponderosa*, and from Shasta county near Forestdale, on *Pseudotsuga taxifolia*. It has been collected by Dr. Hasse in the San Gabriel Range near Los Angeles, and in the Tehachepi Range.

A species found on the bark of living conifers and originally named by Tuckerman from material collected in Oregon, though the only published description is by Nylander. Especially distinguished by its apothecia which are ciliate like those of *Usnea*.

CALOPLACA CIRROCHROA (Ach.) Th. Fr. Lich. Scand. 1: 171. 1871.

Lecanora cirrochroa Ach. Syn. Lich. 181. 1814.

Placodium cirrochroum Tuck. Syn. N. A. Lich. 1: 171. 1882.

Thallus orbicular, closely appressed to the substratum, similar to *C. muro-rum* but smaller and usually thinner; centrally orange yellow and darker, in our specimens a yellowish brown, with lemon-colored soredia, often warty crustose or disappearing, except the radiate, narrowly and intricately lacinate effigurate margin, tips of the narrow radiate lobes usually white pruinose, turning purplish with KOH. Apothecia very rare and minute, scattered, plane, orange yellow with sub-entire margin; spores 5 to 6μ wide and 13 to 18μ long, our scanty specimens sterile.

Rare; on rocks at Alum Rock Park, in the Mt. Hamilton range, at an altitude of about 150 meters. A European lichen of calcareous rocks, collected

in Vermont by Dr. Farlow, but not otherwise known to me from this country. My material, while off-color and not typical, agrees exactly with some specimens collected by me at Mandling, Styria. So far as I know, fertile material has not been collected in America.

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CONTENTS

Hepaticae of the Sixth Edition of Gray's Manual Compared With the Exchange List.	<i>Geo. Hall Conklin</i>	88
Helpful Literature for Students of North American Hepaticae.	<i>Caroline Coventry Haynes</i>	91
A List of Mosses Collected in South California.	<i>C. C. Kingman</i>	93
Additions to the Recorded Mosses of West Virginia.	<i>John L. Sheldon</i>	95
Photographing Mosses (<i>Illustrated</i>)	<i>A. J. Grout</i>	97
Necrology.		97
Reviews:		
Students Handbook of British Hepatics.	<i>A. J. Grout</i>	99
Juvenile Forms of Mosses and Their Culture.	<i>John M. Holzinger</i>	99
Society Notes.		100
Exchange Department		100

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DEVOTED MAINLY TO THE STUDY OF NORTH AMERICAN MOSSES,
HEPATICS AND LICHENS

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THE HEPATICAE OF THE SIXTH EDITION OF GRAY'S MANUAL COMPARED WITH THE EXCHANGE LIST

GEORGE HALL CONKLIN.

Since the publication of the Sixth Edition of Gray's Manual in 1890, many changes have occurred in the nomenclature of the Hepaticae as described by Professor Underwood. In the recent Exchange List, compiled by Miss Caroline C. Haynes and issued by the Society, the known species from the United States and Canada are given. The omission of many of the old names and the addition of many new ones in this list is at once apparent. To meet the inquiries which have come to the writer, it was thought that a comparison of the species in the two publications would be of some service to the students who still refer to the Manual in the absence of other descriptive works. No attempt is made to include the synonymy of all the species, nor to give all the synonymy of each species mentioned. The sequence of the Manual is followed for convenience. Dr. Evans has kindly corrected the errors in this survey of recent hepatic literature.

Frullania virginica Lehm. is now included under *F. eboracensis* Gottsche as a synonym.

Frullania pennsylvanica Steph. is now *Jubula pennsylvanica* (Steph.) Evans.

Frullania aeolotis Nees is a synonym of *F. riparia* Hampe.

Frullania dilatata Nees. The American plant is distinct from the European *F. dilatata* (L.) Dumort., and is now known as *F. Brittoniae* Evans.

Frullania fragilifolia Tayl. The American plant is distinct from the European species of this name and is now known as *F. Selwyniana* Pears.

Jubula Hutchinsiae Dumort. var. *Sullivantii* Spruce, is a synonym of *J. pennsylvanica* (Steph.) Evans.

Lejeunea clypeata Sulliv. is now *Leucolejeunea clypeata* (Schwein.) Evans.

Lejeunea serpyllifolia Libert var. *americana* Lindb., is a synonym of *L. cavi-folia* (Ehrh.) Lindb. so far as plants of the Manual range are concerned. Plants of the southern United States, which Lindberg referred to his variety *americana*, belong to *L. flava* (Swartz) Nees.

Lejeunea lucens Tayl. is a synonym of *Microlejeunea laetevirens* (Nees & Mont.) Evans.

Lejeunea calcaria Libert. The American plant is distinct from the European *Cololejeunea calcaria* (Libert) Schiffn. and is now known as *Cololejeunea Biddlecomiae* (Aust.) Evans.

Porella Thuja Lindb. The American plant is distinct from the European *Po-*

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- rella Thuja* (Dicks.) Lindb. and is now included under *Porella platyphylla* (L.) Lindb. as a synonym.
- Porella dentata* Lindb. is a synonym of *Porella rivularis* (Nees) Trevis.
- Porella Sullivantii* Underw. is now included under *P. pinnata* L. as a synonym.
- Ptilidium ciliare* Nees is now separated into two species, *P. ciliare* (L.) Nees and *P. pulcherrimum* (Web.) Hampe.
- Trichocolea Biddlecomiae* Aust. is now regarded as a poorly developed form of *T. tomentella* (Ehrh.) Dumort.
- Bazzania deflexa* Under. is a synonym of *B. tricrenata* (Wahl.) Trevis.
- Cephalozia virginiana* Spruce is included under *C. serriflora* Lindb. as a synonym.
- Cephalozia multiflora* Spruce is a synonym of *C. lunulaefolia* Dumort.
- Cephalozia divaricata* Dumort. This species is now separated into *Cephaloziella Hampeana* (Nees) Schiffn. and *C. Starkii* (Nees) Schiffn.
- Cephalozia Sullivantii* Aust. is now *Cephaloziella Sullivantii* (Aust.) Evans.
- Odontoschisma sphagni* Dumort. The true *O. sphagni* (Dicks.) Dumort. has not yet been found in the United States. The plants which have been referred to this species belong to *O. prostratum* (Swartz) Trevis.
- Kantia Trichomanis* S. F. Gray is now *Calypogeia Trichomanis* (L.) Corda.
- The following species have recently been segregated from *C. Trichomanis*: *C. Neesiana* (Massal. & Carest.) C. Müll. Frib., *C. suecica* (Arn. & Perss.) C. Müll. Frib., and *C. sphagnicola* (Arn. & Perss.) Warnst. & Loeske.
- Kantia Trichomanis* var. *tenuis* Aust. is now *Calypogeia tenuis* (Aust.) Evans.
- Kantia Sullivantii* Underw. is now *Calypogeia Sullivantii* Aust.
- Scapania Oakesii* Aust. is now included under *S. dentata* Dumort. as a synonym.
- Scapania exsecta* Aust. is now *Sphenolobus exsectus* (Schmid.) Steph.
- Diplophyllum albicans* Dumort. var. *taxifolium* Nees, includes *Diplophyllia taxifolia* (Wahl.) Trevis, and *D. apiculata* Evans.
- Lophocolea Austini* Lindb., *Lophocolea Macounii* Aust., and *Lophocolea Hallii* Aust. are now all included under *Lophocolea heterophylla* (Schrad.) Dumort. as synonyms.
- Chiloscyphus ascendens* Hook. & Wils. is now included under *Chiloscyphus pallescens* (Ehrh.) Dumort. as a synonym.
- Plagiochila porelloides* Lindenb. is now included under *P. asplenoides* (L.) Dumort. as a synonym.
- Plagiochila interrupta* Dumort. is now *Pedinophyllum interruptum* (Nees) Pears.
- Plagiochila spinulosa* Dumort. The American plant is distinct from the European *P. spinulosa* (Dicks.) Dumort. and is now known as *Plagiochila Sullivantii* Gottsche.
- Lioclaena lanceolata* Nees is now *Jungermannia lanceolata* L.
- Jungermannia Schraderi* Mart. is now *Jamesoniella autumnalis* (DC.) Steph.
- Jungermannia Gillmani* Aust. is a synonym of *Lophozia inflata* (Huds.) M. A. Howe.
- Jungermannia Wattiana* Aust. is a synonym of *Lophozia heterocolpa* (Thed.) M. A. Howe.
- Jungermannia barbata* Schreb. is now *Lophozia barbata* (Schreb.) Dumort.

Jungermannia barbata var. *attenuata* Mart. is now *Lophozia attenuata* (Mart.) Dumort.

Jungermannia setiformis Ehrh. is now *Temnoma setiforme* (Ehrh.) M. A. Howe.

Jungermannia alpestris Schleich. is now *Lophozia alpestris* (Schleich.) Evans.

Jungermannia ventricosa Dicks. is now *Lophozia ventricosa* (Dicks.) Dumort.

Jungermannia Wallrothiana Nees. This species is not understood, even in Europe, and is therefore omitted from the Exchange List.

Jungermannia laxa Lindb. is a synonym of *Lophozia marchica* (Nees) Steph.

Jungermannia excisa Dicks., as described in the Manual, is now *Lophozia bicornata* (Schmid.) Dumort.

Jungermannia excisa var. *crispa* Hook. is *Lophozia excisa* (Dicks.) Dumort., as now understood.

Jungermannia incisa Schrad. is now *Lophozia incisa* (Schrad.) Dumort.

Jungermannia Michauxii Web. is now *Sphenolobus Michauxii* (Web.) Steph.

Jungermannia minuta Crantz is now *Sphenolobus minutus* (Crantz) Steph.

Jungermannia Helleriana Nees is now *Sphenolobus Hellerianus* (Nees) Steph.

Jungermannia inflata Huds. is now *Lophozia inflata* (Huds.) M. A. Howe.

Marsupella adusta Spruce. The American plant is distinct from the European *Gymnomitrium adustum* Nees, of which the true *Marsupella adusta* Spruce is a synonym. It is now included under *Marsupella ustulata* (Hübner.) Spruce as a synonym.

Nardia fossombronioides Lindb. is now *Jungermannia fossombronioides* Aust.

Nardia biformis Lindb. is now *Jungermannia biformis* Aust.

Fossombronia Dumortieri Lindb. is a synonym of *Fossombronia foveolata* Lindb.

Fossombronia pusilla Dumort. This European species is not definitely known in America.

Pellia endiviaefolia Dumort., as described in the Manual, is a synonym of *Pellia Neesiana* (Gottsche) Limpr.

Pellia calycina Nees is a synonym of *Pellia Fabroniana* Raddi.

Aneura latifrons Lindb. is now *Riccardia latifrons* Lindb.

Aneura multifida Dumort. is now *Riccardia multifida* (L.) S. F. Gray.

Aneura pinnatifida Nees is a synonym of *Riccardia sinuata* (Dicks.) Trevis.

Aneura sessilis Spreng. is now included under *Riccardia pinguis* as a synonym.

Aneura pinguis Dumort. is now *Riccardia pinguis* (L.) S. F. Gray.

Notothylas melanospora Sulliv. is now included under *N. orbicularis* (Schwein.) Sulliv. as a synonym.

Preissia commutata Nees is a synonym of *Preissia quadrata* (Scop.) Nees.

Fimbriaria tenella Nees is now *Asterella tenella* (L.) Beauv.

Grimaldia barbifrons Bisch. is a synonym of *Grimaldia fragrans* (Balb.) Corda.

Grimaldia rupestris Lindenb. is now *Neesiella rupestris* (Nees) Schiffn.

Asterella hemisphaerica Beauv. is now *Reboulia hemisphaerica* (L.) Raddi.

Lunularia vulgaris Raddi is a synonym of *Lunularia cruciata* (L.) Dumort.

Riccia lamellosa Raddi. The American plant is distinct from the European species of this name and is now known as *Riccia Austini* Steph.

Riccia crystallina L. is now *Ricciella crystallina* (L.) Warnst.

Riccia lutescens Schwein. is now considered the terrestrial form of *Ricciocarpus natans* (L.) Corda.

Riccia tenuis Aust. is a synonym of *Ricciella membranacea* (Gottsche & Lindenb.) Evans.

Riccia fluitans L. is now *Ricciella fluitans* (L.) A. Br.

Riccia fluitans var. *Sullivantii* (L.) Aust. is now *Ricciella Sullivantii* (Aust.) Evans.

Riccia natans L. is now *Ricciocarpus natans* (L.) Corda.

Sphaerocarpus terrestris Smith. The American plant is distinct from the European species of this name and is now known as *Sphaerocarpos texanus* Aust.

HELPFUL LITERATURE FOR STUDENTS OF NORTH AMERICAN HEPATICÆ

CAROLINE COVENTRY HAYNES

CONTINUATION*

"New or Noteworthy Hepaticæ from Florida," A. W. Evans, Bull. Torrey Club. **32**: 219-222, pl. 6. 1905. The following new species are described and figured: *Plagiochila Smallii*, *Cololejeunea diaphana*, *Lejeunea floridana*. There are also valuable notes on other species which, with the new ones, are based on the collections of *Hepaticæ* from southern Florida, made under the direction of the New York Botanical Garden.

"The Hepaticæ of Bermuda," A. W. Evans, Bull. Torrey Club. **33**: 129-135, pl. 6. 1906. A new species is described and figured: *Crossotolejeunea bermudiana*. The present paper is based on six recent collections and increases the number of known species on the Island to twenty-three.

"Leucolejeunea, a new Genus of Hepaticæ," A. W. Evans, Torrey Club. **7**: 225-229. Dec., 1907. This gives a fine description of the new genus and the five species belonging to it, which the author has separated from the genus *Archilejeunea*: *L. clypeata*, *L. unciloba*, *L. conchifolia*, *L. zanthocarpa*, *L. rotundistipula*.

"New West Indian Lejeuneae," A. W. Evans, Bull. Torrey Club. **35**: 371-389, pl. 26-28. 1908. One local species is made the type of the new genus, *Leiolejeunea grandiflora*, which with the five additional new species are fully described and figured: *Trachylejeunea dilatata*, *Harpalejeunea reflexula*, *Odonotolejeunea longispica*, *Brachiolejeunea bahamensis*, *Symbezidium laceratum*. The author refers to his papers on Puerto Rican flora for an account of the generic peculiarities of the five species.

* THE BRYOLOGIST, **11**: 32, 33. 1908.

"The Hepaticæ of the Bahama Islands," A. W. Evans, Bull. Torrey Club. **38**: 205-222. *pl. 9, 10.* 1911. "The present paper includes a full report on the various specimens studied by the writer." Two new species: *Rectolejeunea Brittoniae*, *Ceratolejeunea integrifolia*, and a new combination: *Taxilejeunea obtusangula*, bring the number of known species on the Islands up to thirty-four.

"Vegetative reproduction in *Metzgeria*," A. W. Evans, Ann. Bot., Vol. 24. No. XCIV. April 1910. With sixteen figures in the text. Contains a review of the authors who have studied gemmae from the morphological standpoint; of Lindberg's ineffectual endeavor to fully establish their value for the taxonomist, and of the general neglect of this means of classification shown by most of the Hepaticologists. The author while studying North American material, found abundant proof of the specific value of gemmae and discusses it in relation to thirteen species. Four of these are new and are described: *M. uncigera*, *M. Oligotricha*, *M. vivipara*, *M. disciformis*. This interesting paper gives a comparison of the gemmae of *Metzgeria*, and those of other Bryophytes and gives conditions under which gemmae are produced, and ends with a list of the Literature cited.

"Branching in the Leafy Hepaticæ," A. W. Evans, Ann. Bot. Vol. 26. No. CI. Jan. 1912, with thirty-six figures in the text. Through original investigations, the author has added richly to the subject which has been previously studied by Leitgeb and a few others. The various types of branching in the Jungermanniales are fully described and numerous examples and beautifully clear figures added. To the serious student, these papers are all invaluable.

"Notes on New England Hepaticæ," A. W. Evans (in continuation*), Rhodora, Oct. 1908. Oct. 1909. Oct. 1910. Jan. 1912.

"The Distribution of Hepaticæ in Scotland," Symers M. Macvicar. Trans. and Proc. Bot. So. Edin. Vol. 25. 1910. The three hundred and thirty-six pages of this book contain a great deal of information that is of value to our own students. The following titles indicate the contents of the first part of the volume to which is added a list of collectors: Historical notes; General notes on the Flora; Rainfall; Latitude; Atlantic and Western and Eastern species; Habitats; Altitudes to which species ascend; Comparison with other countries. Sketch of the Flora of the Provinces, Sub-Provinces and Vice-Counties. The major part of the volume is devoted to the Distribution, which is worked out with an infinite patience. Besides the data, the two hundred and twenty-five species are discussed critically.

"The Hepatics of Sussex," W. E. Nicholson. Reprinted from the Hastings and East Sussex Naturalist, Vol. I. No. 6. 1911. This list gives one hundred and twenty-four species. As over one hundred of these occur also in North

* See first list in THE BRYOLOGIST, **11**: 32-33. 1908,

America, I feel justified in including this among the "helpful." The paper begins by giving a good life history of an hepatic from spore to spore. The rarer and newer species have long notes of interest and twenty-one species are figured.

To be Continued

HIGHLANDS, N. Y.

A LIST OF MOSSES COLLECTED IN SOUTHERN CALIFORNIA

C. C. KINGMAN

The following mosses were collected in the San Gabriel Mts., and the region around Pasadena, while a few were found at Santa Catalina Island and at Santa Barbara. I am indebted to Prof. John M. Holzinger, Mr. R. S. Williams and Mrs. E. M. Dunham for determining many of the species.

- Alsia circinalis* Sulliv. On rocks and trees, San Gabriel Mts.
Alsia longipes S. & L. Damp rocks, San Gabriel Mts.
Amblystegium riparium (L.) B. & S. On submerged rocks in creek, Santa Barbara.
Amblystegium serpens (L.) B. & S. Shady lawn, Pasadena.
Amblystegium varium (Hedw.) Lindb. Mt. Wilson trail, San Gabriel Mts.
Anacolia Menziesii (Turn.) Paris. On damp rocks, San Gabriel Mts.
Antitrichia californica Sulliv. San Gabriel Mts.
Barbula rigidula (Hedw.) Sch. Canyons of San Gabriel Mts.
Barbula semitorta Sulliv. Pasadena.
Barbula subfallax Muell. Millard Canyon, San Gabriel Mts.
Barbula vinealis Brid. Santa Catalina Island, and Santa Barbara.
Brachythecium Bolanderi (L.) J. & S. Rubio Canyon, San Gabriel Mts.
Brachythecium californicum (Lesq.) J. & S. On trees, Santa Ynez Mts.
Brachythecium rutabulum (L.) B. & S. Mt. Wilson trail, San Gabriel Mts.
Bryum argenteum L. Common everywhere in waste places.
Bryum obconicum Hornsch. Santa Catalina Island.
Bryum torquescens B. & S. Canyons of San Gabriel Mts., also Santa Barbara.
Camptothecium arenarium (Lesq.) Ren. & Card. Gravelly banks, Pasadena.
Camptothecium pinnatifidum (S. & L.) J. & S. On shaded rocks, San Gabriel Mts.
Claopodium leuconeurum (S. & L.) R. & C. Shady banks, Pasadena and San Gabriel Mts.
Desmatodon arenaceus S. & L. Grassy places, Santa Monica.
Desmatodon Guepini B. & S. On the ground, near Pasadena.
Desmatodon nervosus B. & S. On sides of trails, San Gabriel Mts.
Desmatodon plinthobius S. & L. Shady banks near Santa Monica.
Dicranoweisia cirrhata (Hedw.) Lindb. On decaying logs, San Gabriel Mts., above 3,000 feet.
Didymodon tophaceus (Brid.) Jur.

- Near calcareous spring, Santa Catalina Island.
- Encalypta vulgaris* (Hedw.) Hoffm. var *obtusa*. Schimp. Rubio Canyon, San Gabriel Mts.
- Eucladium verticillatum* (L.) B. & S. On calcareous rocks, and fruiting freely. San Gabriel Mts.
- Eurhynchium praelongum* (L.) Bryhn. On damp rocks, San Gabriel Mts. and Santa Ynez Mts.
- Fabronia octoblepharis* (Schleich) Schw. On trees, rare. Rubio Canyon, San Gabriel Mts.
- Fissidens limbatus* Sulliv. Shady banks, common. Pasadena and San Gabriel Mts.
- Funaria calcarea* Wahlenb. Shady banks, occasional. San Gabriel Mts.
- Funaria convoluta* Hamp. Los Flores Canyon, San Gabriel Mts., rare.
- Funaria hygrometrica* (L.) Sibth. Waste places and burnt ground, common.
- Grimmia californica* Sulliv. Common on rocks and ledges.
- Grimmia leucophaea* Grev. Occasional, on rocks. San Gabriel Mts.
- Grimmia trichyophylla* Grev. Growing in dense cushions on rocks, San Gabriel Mts.
- Gymnostomum calcareum* Nees & Hornsch. Calcareous rocks, canyons of San Gabriel and Santa Ynez Mts.
- Hedwigia albicans* (Web.) Lindb. On rocks, San Gabriel Mts.
- Isoetecium Brewerianum* (Lesq.) Kindb. Mt. Wilson trail, San Gabriel Mts.
- Leptobryum pyriforme* (L.) Wils. Millard Canyon, San Gabriel Mts.
- Mniobryum albicans* (Wahlenb.) Limpr. Wet rocks and springy places, San Gabriel Mts.
- Orthotrichum Bolanderi* Sulliv. On rocks, canyons of San Gabriel Mts.
- Orthotrichum cylindrocarpum* Lesq. On trees, Pasadena and San Gabriel Mts.
- Orthotrichum Lyellii* Hook. and Tayl. On trees in higher elevations of San Gabriel Mts.
- Orthotrichum rupestre* Schleich. On rocks, canyons of San Gabriel Mts.
- Pleuridium Bolanderi* Muell. On the ground, near Pasadena.
- Polytrichum piliferum* Schreb. Echo Mt., San Gabriel Mts. Small and sterile.
- Pterogonium gracile* Swartz. Common on ledges, San Gabriel and Santa Ynez Mts.
- Scleropodium apocladum* (Mitt.) Grout. Rocks and ledges, Pasadena and San Gabriel Mts.
- Scleropodium illecebrum* B. & S. On rocks, Pasadena and San Gabriel Mts.
- Scleropodium obtusifolium* (Hook) Kindb. On wet, dripping rocks, often growing in the spray of a waterfall, San Gabriel Mts.
- Timmiella flexiseta* (Bruch) Limpr. "Sturdevant trail." San Gabriel Mts.
- Timmiella Vancouverensis* Broth. San Gabriel Mts. Det. Best.
- Tortula brevipes* (Lesq.) Broth. Gravelly places and old walls, Pasadena and San Gabriel Mts. Specimen No. 1241 collected on wall of Old San Gabriel Mission.
- Tortula muralis* (L.) Hedw. Rocks and old walls, Santa Barbara.
- Tortula princeps* De Not. (Listed as *T. Muelleri* Wils.) Frequent in canyons of San Gabriel Mts.
- Tortula ruralis* (L.) Ehrh. On decaying logs, Pasadena.
- Weisia viridula* (L.) Hedw. Shady banks, San Gabriel and Santa Monica Mts.

To this list should be added the following additional mosses reported by Prof. John McClatchie in 1891. (History of Pasadena, Cal.—Reid. 1895.)

<i>Amblystegium irriguum</i> (Hook & Wils.) B. & S.	<i>Bryum turbinatum</i> (Hedw.) Schwaegr.
<i>Aulacomnium androgynum</i> (L.) Schwaegr.	<i>Fissidens grandifrons</i> Brid. <i>Pohlia nutans</i> (Schreb.) Lindb.

ADDITIONS TO THE RECORDED MOSSES OF WEST VIRGINIA

JOHN L. SHELDON

In so far as I am aware, no considerable addition to the list of mosses of West Virginia has been made since the one made by Dr. Andrews* in 1905. For the past eight years I have been collecting, among other things, an occasional moss. With the assistance of several members of the S. M. S., I have recently completed an examination of these specimens and am now able to add the following:

Amblystegium Juratzkanum Schimp. On bark of decaying log, south of Morgantown (1352).

Anacamptodon splachnoides (Fröl.) Brid. In a knot hole of an apple tree, Lick Run (3337).

Anomodon apiculatus Br. & Sch. On trunk of beech in woods, Cranberry Glades (3721).

Aphanorrhagma serratum (Hook. & Wils.) Sulliv. Roadside leading from North Front Street, Morgantown (2689, 3973); south side of Decker's Creek near where Aaron's Run empties into the creek (4314).

Barbula unguiculata (Huds.) Hedw. On curbstone along Front Street (2051) and on a pile of stones in South Park (2279), Morgantown; on rocks along a small stream near Fort Spring (2803).

Brachythecium acuminatum (Hedw.) Kind. *forma*. On tree trunk, Marilla (1417).

Brachythecium digastrum C. M. & K. On decayed log, Lick Run (3968).

Brachythecium plumosum (Sw.) Br. & Sch. On wet ledge along Decker's Creek opposite Marilla (4003, 4009).

Bryum intermedium Brid. Morgantown (167, 169, 1268); Middle Ferry (2340); Lick Run (3957). Dr. Grout says No. 2340 is not typical.

Bryum pseudotriquetrum (Hedw.) Schwaegr.(?) Bank along railroad, Sturgis (186). Doubtfully referred to this species by Dr. Grout.

Cirriphyllum Boscii (Schwaegr.) Grout. Morgantown (1270); on ledge near Burnt House (4230).

Desmatodon Porteri James. On sandstone rock near Ravenswood (2388).

Dicranum fuscescens Turn. Cheat Bridge (2538).

* Andrews, A. LeRoy. Additions to the Bryophytic Flora of West Virginia. THE BRYOLOGIST 8: 53-65. Jy. 1905.

Ditrichum rhyncostegium Kind. n. sp.* On fresh soil along log road, Cranberry Glades (3743).

Fissidens minutulus Sulliv. On rocks in Aaron's Run (3934) near Morgantown.

Fissidens obtusifolius Wils. "On walls of Lock No. 9, Monongahela River about 1 mile south of the Pa.-W. Va. state line." Collected by Otto E. Jennings.

Fissidens subbasilaris Hedw. On tree trunk, French Creek (2093).

Homalotheciella subcapillata (Hedw.) Card. On tree trunk, Cheat Bridge (2512).

Hypnum patientiae Lindb. On wet rocks along a small stream, Morgantown (2312).

Leskea gracilescens Hedw. On tree trunk, Seebert (3618).

Leskea polycarpa Ehrh. On trunk of poplar, Engine Works (2390); on trunk of apple, Albright (3365).

Mniobryum albicans (Wahl.) Limpr. Edge of stream near Oliver (2921).

Mnium marginatum (Dicks.) Beauv. On rocks, Dellslow (3209).

Myurella gracilis (Weinm.) Lindb. On ledge, Sabraton (3283).

Orthotrichum Porteri Aust. On outcropping limestone, Martinsburg (2653).

Plagiothecium micans (Sw.) Paris. On rock, Cranberry Glades (3722).

Plagiothecium striatellum (Brid.) Lindb. On ledge, McKinney's Cave, Bretz (4172).

Plagiothecium sylvaticum Br. & Sch.? On decaying log, Cranberry Glades (3793).

Plagiothecium turfaceum Lindb. On decaying log, Cranesville (3452).

Platygyrium repens (Brid.) Br. & Sch. On decaying log, Morgantown (175).

Pohlia nutans (Schreb.) Lindb. On decaying wood and soil. Cranesville (1525, 3458); Terra Alta (3472); McKinney's Cave, Bretz (4074); near Oak Park (4067, 4984); Morgantown (4948).

Raphidostegium carolinianum (C. M.) J. & S. Tibbs Run (553); on rock, Quarry Run (3031); on ledge, Burnt House (4236); on wet rock near McKinney's Cave, Bretz (4168).

Raphidostegium carolinianum admixtum (Sull.) Grout. On ledge, Burnt House (4235).

Raphidostegium marylandicum (C. M.) J. & S. On rock in small stream, Cheat Bridge (2572).

Rhabdoweisia fugax (Hedw.) Br. & Sch. On ledge, Cooper's Rock (3039); on ledge and roots of various trees, McKinney's Cave, Bretz (4169); on sandstone ledge, Tibbs' Run (4355).

Sphagnum Girgensohnii Russ. Cranberry Glades (3845).

Sphagnum imbricatum affine (R. & C.) Warnst. Tibbs' Run (629); Cranesville (1548); Lick Run (3966).

Sphagnum magellanicum Brid. Cranesville (3457).

Sphagnum recurvum Beauv. Cranesville (1535, 3459); Cranberry Glades (3677, 3678).

* Revue Bryologique, 1910: 14, Ja. 1910.

Thuidium microphyllum (Sw.) Best. On decaying log, Morgantown (3885); along path and roadside in woods near McKinney's Cave, Bretz (4173, 4176).

Thuidium virginianum Lindb. On rock near Mont Chateau (1529).

Uloa Ludwigii Brid. On trunk of birch, Durbin (1044); Cranberry Glades (3673).

WEST VIRGINIA UNIVERSITY

PHOTOGRAPHING MOSSES*

In March, 1911, the Editor offered prizes for good photographs of mosses, but no entries of sufficient merit were received until after the time limit set had expired and then only one or two were received that were considered good enough for reproduction. For various reasons, even these did not become available for the BRYOLOGIST. Almost the only good photographs of mosses that have been published were in Nina Marshall's book in the Nature Library series, but unfortunately, the photographs were about the only good thing about the book. Prof. Fink and others have produced some excellent photographs of lichens, but nothing equally good has been produced of the mosses and hepatics, so far as the editor knows. Just how much of the beauty and delicacy of moss structure and outline can be adequately reproduced by photography is an unanswered question. The photograph herewith presented represents an attempt to find out what the camera will do. The Editor has set as his bryological task for the next few years, the problem of the photography of mosses and will be glad of suggestive criticisms and prints from other people's negatives. This photograph was taken with a Wollensak Royal Anastigmat, series I, used in a Bausch and Lomb camera constructed for micro-photography, the very long bellows making possible the enlargement. The stop was U. S. 16, the light from two windows behind the camera and the plants posed with a background of black velvet. The exact time of exposure unfortunately was not noted in a "findable" place.

NECROLOGY

Jean Gabriel Edward Narcisse Paris died April 30, 1911, in his eighty-fourth year, having been born November 8, 1827, in Saint Contest, in the department of Calvados, a part of lower Normandy. He died at Dinard, in the department of Ille-et-Vilaine. This is also in the northwest corner of France bordering the English Channel and forming a part of the old province of Normandy. He was "General de Brigade," hence the more familiar name General Paris; he was also commander of the Legion of Honor. Having reached the age limit in 1889, he was retired, and it was after this time that he issued his best known work, the Index Bryologicus, the first edition in 1900, and the second in 1906. In 1862,

* See Plate IV.



PLATE IV

Bryum caespitium L. $\times 2$.



he published "Cours bryologique aux environs de Chambéry," where he was garrisoned during 1861 and 1862. Paris was an early correspondent with Th. Husnot, was a friend of Schimper and collaborated with him in 1870 on the "Monographie des Cryptogamées." In 1902, appeared "Musci Japonici." For a more extended notice, see *Revue Bryologique*, No. 4, 1911, pp. 93-95 by Th. Husnot.

A. M. S.

Dr. E. Levier died October 26, 1911, in Florence, Italy, at the age of 73, after a long illness. He was born in Berne, Switzerland, in 1838. He studied medicine, but all the time was occupied with botany as well, making important collections of both phanerogams and cryptogams. He later devoted much attention to the Hepatics, giving especial study to the *Ricciaceæ*. See *Revue Bryologique* No. 2, 1912, p. 23, 24, for a list of his published works.

A. M. S.

Sir Joseph Dalton Hooker died at his residence, The Camp, near Sunningdale, December 10, 1911, in his 95th year, having been born at Halesworth, in Suffolk, England, June 30, 1817. His father, William Jackson Hooker, was a noted naturalist and author, was professor in the Botanical Garden at Glasgow, and later became Director of the Royal Gardens at Kew. His son Joseph was therefore born into a botanical heritage, and while pursuing his undergraduate studies spent all his spare time at work in his father's herbarium. He obtained his degree of Doctor of Medicine at Glasgow, in 1839.

He was early interested in works of travel. At the close of his medical studies, he was appointed Assistant Surgeon in the Royal Navy, and in the "Erebus," accompanied by the "Terror" went to explore the Antarctic under Sir James Ross. This was the beginning of many years of travel and study resulting in a long list of published works. In 1855, he became Assistant Director at Kew, under his father, and for ten years spent all his time working up the antarctic collections. In 1865, on the death of his father, he was made Director of the Royal Gardens at Kew, and occupied this post till he died. Honors came to him, that of the Presidency of the Royal Society, the highest that an Englishman of science can attain, was his in 1873, and the following five years. His friends were legion, our Dr. Asa Gray being one, and he was one of a small number of Honorary Members of our Torrey Botanical Club.

He died at the house so long occupied by his father and himself, and while Westminster Abbey offered to receive his ashes, as was most fitting, still his expressed wish was granted, and he lies in the family vault at Kew, with many of his kindred. He left a wife, one daughter unmarried, and five sons. For an extended notice, see *Bulletin of Miscellaneous Information of the Royal Botanic Gardens, Kew*, No. 1, 1912, pp. 1-18, and for Bibliography, pp. 18-34. Between 1837 and 1911, two hundred and twenty-eight titles are listed.

A. M. S.

REVIEWS

THE STUDENT'S HAND-BOOK OF BRITISH HEPATICS

BY S. M. MACVICAR

This is a companion book to Dixon's Handbook of Mosses and is published by the same house. (see adv.) It gives every indication of being as useful to American students of hepatics as Dixon's work has to American students of Mosses.

It is "Demy 8vo.," of 463 pages of clear print on excellent paper. The numerous illustrations by Jameson are clear and pleasing and are *inserted in the text* instead of being placed in plates at the end. This arrangement is a very great saver of time to the student and adds to the attractiveness of the pages.

The Introduction discusses the general characters and structure of the Hepaticeae, "Vegetative Reproduction," "Collection and Examination" and "Classification and Nomenclature."

The keys are based on easily ascertainable characters so far as possible. The descriptions are clear and concise, yet ample and expressed, in simple language. There is a sufficient synonymy and an abundance of critical notes.

It is a book necessary to every student of hepatics, whether a beginner or a college professor. Its only serious failing for American students is that it treats of British plants instead of American. May we soon have an American book on the same plan! For the convenience of American students, I have arranged to keep the book in stock for a few months so as to make immediate delivery.

A. J. GROUT

THE JUVENILE FORMS OF MOSSES AND THEIR CULTURE

(Die jugend Formen der Laubmoose und ihre Kultur). By P. Janzen.

In German. Reprinted from the 35. Bericht des Westpreussischen Botanisch—Zoologischen Vereins, at Danzig, Press of A. W. Kafeman G. m. b. H., 1912.

This reprint is probably repaged, comprising pages 1 to 62. There are 21 figures printed in the text.

In the introduction of 9 pages, the author gives the instructive history of the efforts at germinating moss spores in the attempt to follow out their life history. The merits of Hedwig, Bridel, Naegeli, Schimper, Guembel, and of others, in this investigation are touched upon, and the story of our present viewpoint on the nature of the protonema and its place in the life history of Mosses is well told. The author then gives the details of his method of moss spore germination, advocating as the best substratum agar-agar, with the usual nutrient solutions, in small Petri dishes. Students desiring to continue these investigations, as well as teachers who may wish to repeat these efforts in their instructions, will find helpful hints in this paper.

Twenty mosses were studied by the author: of these, the spores of 17 were successfully germinated. But on only 10 of these were leaf buds formed. And he remarks on this point, that "Cultures are questions which we address to Dame Nature, but which she will answer us rightly only when we frame our questions aright."

Some progress is made by this investigator in the determination that the period after the winter solstice seems the best suited for beginning the cultures, that bud formation is favored by the light (not warmth) of high summer, that different groups of mosses have characteristic protonema, that in some species the protonema is positively, in others negatively heliotropic, that germination is successful only under favorable light conditions, and that agar-agar, with the proper chemical nutrients added, is excellent for the pursuit of this investigation.

JOHN M. HOLZINGER, Winona, Minn., Oct. 17, 1912.

NOTES

Notice—Election of Sullivant Moss Society Officers for 1913—Send ballots at once to Mrs. Mary G. Spencer, Judge of Elections, 4923 Warrington Ave., Philadelphia, Pa. Polls close November 30th. President, Dr. A. W. Evans, New Haven, Conn. Vice-Pres., Mr. E. B. Chamberlain, New York City. Secretary, Mrs. Eva B. Gadsby, Germantown, Pa. Treasurer, Mrs. Annie Morrill Smith, Brooklyn, N. Y.

Polytricum commune is known by the name of "Black Egypt" in Exeter, R. I., where it is very much disliked by the farmer as it is difficult to eradicate from his fields.

H. B. BAILEY

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(To Society Members Only—For Postage)

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Miss Mary F. Miller, Box 203, R. F. D. 4, Station A, Washington, D. C.—*Letharia vulpina* (L.) Wainio. From Switzerland. Collected by the Rev. P. G. M. Rhodes.

Mrs. Elizabeth G. Britton, New York Botanical Garden, Bronx Park, New York.—*Bryoziphium norvegicum* Mitt. Call. by E. G. B. at Dells of the Wisconsin.

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HEPATICS AND LICHENS

VOLUME XVI

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1913



INDEX 1913

(Compiled by Mrs. Eva B. Gadsby)

Star (*) Indicates Illustrations

Acisphagnum (sect. of Sphagnum)		Biatora dilutiuscula comb. nov.	77
	20, 59-61	“ endochroma comb. nov.	40
Alectoria.....	65	“ grossa comb. nov.....	78
“ chalybeiformis.....	34	“ Hochstetteri comb. nov.	78
“ jubata var. implexa....	34	“ hypnophila.....	78
“ oregana.....	48	“ myriocarpella n. sp....	58
Amblystegium.....	42, 43	“ myriocarpoides.....	90, 91
“ floridanum.....	29	“ pilularis comb. nov.....	58
“ fluviatile.....	6	“ pungens.....	91
“ irriguum.....	29	“ sabuletorum var. obscura-	
“ irriguum f. marian-		ta.....	78
“ opolitana.....	32	“ sanguino-atra.....	36
“ Juratzkanum.....	43	“ trisepta.....	78
“ Kochii (<i>Pl. I</i>).....	6	“ turgidula.....	58
“ orthocladon.....	43	“ uliginosa.....	77
“ radiale.....	43	“ var. fuliginea... ..	77
“ riparium.....	43	“ umbrina.....	40
“ serpens.....	43	Biatorina.....	58
“ varium.....	6, 29, 43	Bilimbia.....	78
Amphidium lapponicum.....	5	Borrera.....	65
Anaptychia erinacea.....	48	Brachymenium.....	36, 37
Andreaeaceae.....	89		Klotzschii..... 37
Andreaeales.....	10	“ macrocarpum.....	
Aneura.....	10		(<i>Pl. IV, f. I-9</i>) 36-39
Aneura latifrons.....	50	Brachythecium.....	42, 43
“ palmata.....	50	“ acuminatum.....	43
Anomodon.....	43	“ acutum.....	43
“ minor.....	43	“ caespitosum.....	64
“ rostratus.....	43	“ oxycladon.....	6
Anthoceros levis.....	55	“ pacificum n. sp.*	
“ punctatus.....	55		94, 95
Anthocerotales.....	9, 10	“ rivulare.....	43
Archidiaceae.....	80	“ rutabulum.....	6
Arthonia impolita.....	8	“ salebrosum.....	43, 44
“ pruinosa.....	41	“ subasperrimum.....	96
“ macrotheca.....	41	“ velutinum.....	6
Arthopyrenia.....	41	Braunfelsia scariosa.....	96
Arthothelium orbiliferum.....	48	Breutelia arctuata.....	32
“ pruinascens.....	48	Bruchia.....	28
Aulacomniaceae.....	5	Bruchiaceae.....	89
Aulacomnium palustre.....	5, 43	Bryaceae.....	6
“ var. poly-		Bryeae.....	36
“ cephalum	5	Bryoxiphiaceae.....	89
“ turgidum.....	31	Bryum.....	28, 42, 43
Bacidia.....	40	“ argenteum.....	44
“ endoleuca.....	1	“ bimum.....	44
Baeomyces ericetorum.....	34	“ Bohnhofii.....	64
“ rufus.....	92	“ caespiticium.....	6, 44
Barbula caespitosa.....	17, 18	“ camptoneuron.....	31
“ semitorta.....	31	“ capillare.....	6
“ tortuosa.....	17	“ coronatum.....	28
Bartamia.....	43	“ floridanum.....	31
“ pomiformis.....	5	“ inclinatum.....	6
“ Oederi.....	43	“ intermedium.....	16
Biatora.....	1	“ Muhlenbeckii.....	6
“ atrogrisea.....	1	“ pallens.....	6
“ atrorubens.....	77	“ pendulum.....	6
“ Bauschiana.....	77	“ roseum.....	6
“ cinnabarina.....	58	Buellia.....	58, 91, 92
“ coarctata var. ornata... ..	77	“ parasema.....	35
“ cyrtella.....	58	“ petraea.....	93

Buellia punctiformis.....	92	Collema nigrescens.....	64
Buellieaceae.....	35	Cololejeunea.....	49, 52, 53
Buxbaumiales.....	10	“ Biddlecomiae.....	52-54
Calicium hyperellum.....	80	“ diaphana.....	52-54
Calliergon cordifolium.....	6	“ Jooriana.....	52
“ cuspidatum.....	32	“ minutissima.....	52-54
“ Richardsonii.....	6	“ myriocarpa.....	53
“ Schreberi.....	7	“ setiloba sp. nov.*	
Calliergon stramineum.....	7	“ 51-54, 52 (f. 1-7),	56
Callospisma.....	57	Coniocarpineae.....	36
Camptothecium nitens.....	7	Crypheaceae.....	11
“ Nuttallii var.		Cryphea glomerata.....	29
“ tenue.....	32	Cyclocarpineae.....	33
Campylium chrysophyllum.....	7	Cyclolejeunea Chitonia.....	54
“ polygamum.....	7	Cynodontium polycarpum.....	4
“ stellatum.....	7	“ var. strumiferum.....	4
“ “ var. pro-		“ torquescens.....	31
“ “ tensum.....	32	Dactylina arctica.....	48
Campylopus Nietneri.....	96	Dendrographia leucophaea.....	80
Candelaria concolor var. effusa.....	64	Dermatocarpon monstrosus.....	2
Catharinaea.....	43	“ Zahlbruckneri	
“ angustata.....	44, 48	“ sp. nov.....	2
“ undulata.....	44	Dermistocarpon hepaticum.....	80
Catillaria.....	40, 78	Desmaziera.....	65
“ Hochstetteri.....	78	Dichelyma uncinatum.....	8
“ Laureri.....	36	Dicranella.....	28, 46
Cenozosia.....	65	“ heteromalla.....	29, 30
Cephalozia lunulaefolia.....	56	“ “ Fitzgeraldii.....	28
“ media.....	56	“ “ var. ortho-	
Cephaloziella byssacea.....	56	“ “ carpa.....	30, 90
“ elegans.....	56	“ “ varia.....	29
“ Starkii.....	56	“ salsuginosa	46
Ceratodon.....	43	“ Schreberi.....	4
“ purpureus.....	4, 44, 90	“ varia.....	29, 30
Cercocarpus parvifolius.....	2	Dicranoweisia cirrhata.....	64
Cetraria cucullata.....	34	Dicranaceae.....	4, 89
“ hiascens.....	34	Dicranum.....	42, 43
“ islandica.....	33	“ Bergeri.....	44
“ “ var. crispa.....		“ flagellare.....	4, 44
“ “ Delisaei.....	3	“ fulvum.....	45, 90
“ lacunosa.....	35	“ fuscescens.....	4
“ nivalis.....	34	“ longifolium.....	4
Cheilolejeunea pililoba.....	56	“ scoparium.....	4, 44
Chiloscyphus rivularis.....	55	“ undulatum.....	4
Chiodecton sanguineum.....	32	“ viride.....	90
Cladonia.....	33	Didymodon.....	43
“ alpestris.....	34	“ aeneus.....	25
“ amaurocraea.....	34	“ mexicanus.....	25
“ coccifera var. stemma-		“ revolutus comb. nov.	25
“ “ tina.....	34	“ rubellus.....	44
“ cornucopioides.....	34	“ stenopyxis.....	25
“ cornuta.....	34	Dimelaena.....	57
“ cristatella.....	34	Diplophyllum albicans.....	32
“ deformis f. gonecha.....	56	Ditrichaceae.....	89
“ fimbriata.....	96	Ditrichum.....	27, 43, 90
“ furcata.....	34	“ pallidum.....	8, 27
“ “ var. subulata.....	34	“ rhynchostegium.....	8
“ gracilis.....	34	“ Schimper.....	31
“ “ elongata.....	16	“ tortile.....	44
“ pyxidata f. lepidophora.....	34	Drepanocladi.....	28
“ rangiferina.....	34	Drepanocladus aduncus.....	7, 44
“ squamosa.....	34	“ “ paternus.....	16
“ “ f. denticollis.....	34	“ fluitans.....	7
“ turgida.....	34	“ scorpioides.....	16
“ verticillata.....	34	“ uncinatus.....	7
Clasmatodon parvulus.....	29	“ vernicosus.....	7
Climacium americanum.....	7, 44	Drummondia.....	28
“ dendroides.....	7, 44	Encalypta ciliata.....	5
Collema melaeum.....	56		

Encalypta procera.....	5	Hylocomium triquetrum.....	7, 44
Endopyreneum.....	2	Hycomium flagellare.....	32
Entodon.....	43	Hypnaceae.....	6
“ cladorrhizans.....	44	Hypnum.....	28, 42, 43
“ Drummondii.....	29	“ cordifolium.....	44
“ seductrix.....	29	“ crista-castrensis.....	7, 44
Ephemeropsis tjibodensis.....	16	“ curvifolium.....	7
Ephemerum.....	27	“ Haldanianum.....	44
Eu-Bryales.....	10	“ imponens.....	7, 44
Eucladium verticillatum.....	31	“ ochraceum.....	64
Eurhynchium.....	11	“ Patientiae.....	8
“ serrulatum.....	28	“ reptile.....	8, 64, 96
“ stoloniferum.....	48	“ stellatum.....	64
“ strigosum.....	7	Hypopterygium struthiopteris.....	48
“ var. prae-cox.....	7	Ilex opaca.....	44
Evernia prunastri.....	82	Inophloea.....	20, 21, 24, 60, 61
Fissidens.....	11	Jungermanniaceae.....	55, 56
“ adiantoides.....	44	Jungermanniales.....	10
“ Donellii.....	29	Lecanactis illecebrosa var. mega-	
“ Garberi.....	29	spora var. nov.....	49
“ incurvus.....	29	Lecania brunonis.....	64
“ subbasilaris.....	16, 29	Lecanoraceae.....	35
Fontinalaceae.....	8	Lecanora atryneae.....	57
Fontinalis.....	43	“ Conradi.....	57
“ missourica.....	80	“ exigua.....	40
Forsstroemia floridanus.....	29	“ melanophthalma.....	57
“ trichomitria.....	29	“ f. glauca.....	57
“ var. immersa.....	29	“ nivalis var. minor var. nov.....	57
Frullania.....	13	“ pallescens.....	35
“ Asagrayana.....	96	“ phaeobola.....	9
“ cobrensis.....	55, 56	“ rubina.....	35
“ Rappii.....	55, 56	“ f. discreta f. nov.....	57
Funaria.....	43	“ var. nigromarginata.....	57
“ Bolanderi.....	39	“ var. peltata.....	57
“ hygrometrica.....	5, 28, 44	“ subfusca var. argentata.....	35
“ var. patula.....	28	“ campestris.....	35
“ flavicans.....	28	“ turfacea.....	57
“ rubiginosa sp. nov.*.....	36, 38 (Pl. IV, f. 10-19), 39	“ thysanota.....	57
Georgiaceae.....	4	Lecideaceae.....	36, 77, 90
Georgia pellucida.....	4, 44	Lecidea alboatra var. epipolia.....	90
Gottschea splachnophylla.....	10	“ saxicola.....	90
Graphis sophisticascens.....	80	“ alpicola.....	94
Grimmiaceae.....	4	“ amphibia.....	93
Grimmia.....	43	“ athallina.....	92
“ maritima.....	46, 47	“ concentrica.....	93
“ ovata.....	4	“ confervoides.....	93
“ unicolor.....	4	“ i. dispersa comb. nov.....	93
Gyrophora.....	56	“ contigua.....	36, 79
“ Dillenii.....	36	“ hydrophila.....	77
“ erosa.....	36	“ crustulata f. geographica.....	91
“ hyperborea.....	36	“ cyrtidia.....	91
“ Muhlenbergii.....	36	“ dilutiuscula.....	77
“ proboscidea.....	36	“ dolodes.....	1
Gyrophoraceae.....	36	“ empetraea.....	92, 93
Gyroweisia.....	25	“ fusca.....	36
Harpidia.....	28	“ geographica.....	94
Hedwigia albicans.....	4, 43, 44	“ goniophila.....	91, 92
Hedwigiaceae.....	11	“ grossa.....	78
Hepaticae.....	9, 10, 11, 47	“ lavata.....	94
Heterothecium grossum.....	78	“ myriocarpa var. punctiformis.....	92
Husnotiella Palmeri.....	25	“ myriocarpoides.....	91
“ revoluta.....	25	“ obscurata.....	93, 94
Hygrohypnum palustre.....	7	“ f. ferrata.....	94
“ polare.....	7	“ papillata.....	58
Hylocomium.....	11	“ parapetraea.....	93
“ proliferum.....	7		

<i>Lecidea parasema</i> f. <i>atrorubens</i> ...	77	<i>Mnium cuspidatum</i>	44
“ var. <i>prasinula</i> ...	79	“ <i>hornum</i>	44
“ <i>petraea</i>	93	“ <i>marginatum</i>	6
“ f. <i>dispersa</i>	93	“ <i>orthorrhynchum</i>	6
“ <i>platycarpa</i>	79	“ <i>punctatum</i> var. <i>elatum</i> ...	6
“ <i>polycarpa</i>	36	“ <i>spinulosum</i>	6
“ <i>prasinula</i> f. <i>major</i>	79	“ <i>subglobosum</i>	6
“ <i>scabrosa</i>	92	<i>Mniobryum</i>	43
“ <i>sorediza</i>	79	“ <i>albicans</i>	44
“ <i>sylvicola</i>	90	<i>Neckeraceae</i>	8
“ var. <i>infidula</i>	77	<i>Neckera</i>	43
“ <i>turgescens</i>	92	“ <i>oligocarpa</i>	8
“ <i>verruculosa</i>	91	“ <i>pennata</i>	8
<i>Lejeunea</i>	53	<i>Nephroma helveticum</i>	36
“ <i>pililoba</i>	53, 56	“ <i>laevigatum</i>	36
“ <i>serrulata</i>	54	<i>Nephromopsis ciliaris</i>	35
“ <i>spiniloba</i>	53	<i>Octoblepharum albidum</i>	28
<i>Leocarpus fragilis</i> *.....	45	<i>Odontoschisma elongatum</i>	56
“ <i>vernicosus</i>	45	<i>Oncophorus Wahlenbergii</i>	4
<i>Leptobryum</i>	43	<i>Opegrapha herpetica</i>	41
“ <i>pyriforme</i>	6, 44	“ <i>prosodea</i> f. <i>diaphora</i>	40, 41
<i>Leptocolea</i>	52, 53	“ <i>varia</i> var. <i>lutescens</i> ...	59
“ <i>cuneifolia</i>	53	<i>Orthotrichaceae</i>	5, 11
“ <i>Joorianae</i>	52	<i>Orthotrichum</i>	28
<i>Leptocolea p'anifolia</i>	53	“ <i>anomalum</i>	5
<i>Leptodon Smithii</i>	80	“ <i>pusillum</i> *.....	17, 18, 19
<i>Leptolejeunea hamulata</i>	54	“ <i>rupestre</i>	80
<i>Leptotheca Wrightii</i>	28, 37	<i>Orthotrichum speciosum</i> var. <i>Killiasii</i>	5
<i>Leskeaceae</i>	6	<i>Pallavicinia hibernica</i>	55
<i>Leskea microcarpa</i>	29	<i>Paludella squarrosa</i>	5
“ <i>nervosa</i>	6	<i>Papillaria nigrescens</i>	29
<i>Letharia thamnodes</i>	33	<i>Parmelia</i>	65
<i>Leucobryaceae</i>	11, 89	“ <i>Borreri</i> var. <i>rudecta</i> ...	35
<i>Leucobryum glaucum</i>	4, 44	“ <i>centrifuga</i>	35
“ <i>sediforme</i>	28	“ <i>ceruchis</i> *.....	70, 74
<i>Leucodon sciurioides</i>	8	“ <i>conspersa</i>	35
<i>Libocedrus decurrens</i>	1	“ <i>furfuracea</i> var. <i>Cladonia</i>	
<i>Lichen</i>	65	“ <i>comb. nov.</i>	35
“ <i>calicaris</i>	82	“ <i>olivacea</i> var. <i>sorediata</i> ...	35
“ <i>islandicus</i> (<i>Pl. III</i>).....	34	“ <i>perlata</i>	35
“ <i>pollinarius</i>	85	“ <i>pertusa</i>	35
“ <i>polymorphus</i>	86	“ <i>physodes</i>	35
“ <i>scopulorum</i> (<i>Pl. VIII</i>).....	89	“ <i>polymorpha</i> (<i>Pl. IX</i>).....	89
<i>Litophloea</i>	74	“ “ var. <i>capitata</i> * (<i>Pl. IX</i>).....	89
<i>Lobaria</i>	65	“ <i>polymorpha</i> var. <i>empletata</i> (<i>Pl. IX</i>).....	87, 89
“ <i>amplissima</i>	36	“ <i>polymorpha flabellulata</i> * (<i>Pl. IX</i>).....	89
“ <i>pulmonaria</i>	36	“ <i>plymorpha</i> var. <i>ligulata</i> (<i>Pl. IX</i>).....	89
<i>Lophozia badensis</i>	47	“ “ var. <i>strepilis</i> (<i>Pl. IX</i>).....	89
“ <i>Baueriana</i>	56	“ “ var. <i>tinctoria</i> (<i>Pl. IX</i>).....	89
“ <i>Hatcheri</i>	47, 56	“ <i>saxatilis</i> var. <i>sulcata</i> ...	35
“ <i>heterocolpa</i>	47	<i>Parmeliaceae</i>	35
“ <i>Lyoni</i>	56	<i>Parmeliopsis aleurites</i>	35
“ <i>quinqüedentata</i>	56	“ <i>ambigua</i>	35
“ <i>Rutheana</i>	47	<i>Pellia</i>	10
<i>Macromitrium rhabdocarpum</i>	28	<i>Peltigeraceae</i>	35
<i>Magnolia glauca</i>	40, 41	<i>Peltigera polydactyla</i>	35
<i>Malacosphagnum</i> 20, 24, 60, 61, 76		“ <i>scutata</i>	35
<i>Marchantiales</i>	9, 10	<i>Philonotis</i>	43
<i>Maronea constans</i> var. <i>sublecid-eina</i> var. <i>nov.</i>	1	<i>Physcia</i>	65
<i>Marsupella aquatica</i>	56	“ <i>speciosa</i> var. <i>minor</i> var. nov.*.....	39, 40
“ <i>robusta</i>	56		
<i>Mastolejeunea auriculata</i>	54		
<i>Meeseaceae</i>	5		
<i>Melaspilea arthonioides</i>	32		
<i>Metzgeriaceae</i>	55		
<i>Mnium</i>	28, 42, 43		
“ <i>affine</i> var. <i>ciliare</i>	44		
“ “ <i>rugicum</i>	44		

Physciaceae.....	35	Ramalina farinacea.....	85, 88
Plagiothecium.....	44	“ var. angustisima.....	85
“ denticulatum.....	8	“ fastigiata.....	33
“ deplanatum.....	96	“ flaccescens.....	67, 72
“ geophilum... 8, 9,	48	“ homalea 67-70, 73, 74, 82	69 f. 1, (Pls. V, VII)
“ micans.....	28	“ homalea var. disrupta	67-69
“ turfaceum.....	8	“ f. isidiosa.....	68
Platygyrium repens.....	16	“ javanica.....	85
Platysma glaucum.....	35	“ maciformis.....	81
“ fahlunense.....	35	“ polymorpha 81, 82, 85-88	
“ hepatizon.....	35	“ var. em-plecta 81, 87	
“ lacunosum var. atlanti-		“ var. ligu-	
“ cum.....	35	“ lata 85, 86	
“ Oakesianum.....	35	“ pollinaria 81, 86, 88 (Pl. IX)	
Pleuridium.....	28	“ var. humilis 81, 82,	
Pleuroweisia.....	11	“ 87, 88 (Pl. IX)	
Pogonatum.....	43	“ var. Duriaei 81	
“ alpinum.....	4	“ elatior 89	
Pohlia cruda.....	6	“ (Pl. IX)	
“ nutans.....	6	“ populina.. 73, (Pl. V)	
Polyporus.....	77	“ pusilla... 74, 85 (Pl. VI)	
Polytrichaceae.....	4	“ rigida..... 74, (Pl. VI)	
Polytrichales.....	10	“ scopulorum..... 83-86	
Polytrichum.....	43	“ var. cuspidata	
“ commune..... 4,	44	“ 84, 89 (Pl. VIII)	
“ juniperinum... 4,	44	“ subfarinacea. 85	
“ ohioense.....	4	“ subfarinacea... 81, 84, 85	
“ piliferum.....	4	“ testudinaria 67, 69, 73	
“ strictum.....	4	“ 74, 82, (69 f. 1), (Pl. VI)	
Pottiaceae.....	25	“ testudinaria var. inter-	
Prionolejeunea serrulata.....	54	“ media 67, 69, 74, (Pl. VII)	
Pseudophyscia.....	39	“ testudinaria var. humi-	
“ aquila.....	35	“ lis.. 71, 73, 74, (Pl. VII)	
“ speciosa.....	34	“ usnea..... 74, (Pl. VI)	
Pseudophysciaceae.....	34	Raphidostegium adnatum.....	28
Pterygandrum filiforme.....	6	“ Kegelianum var.	
Ptychomitrium.....	43	“ floridanum....	28
Pylaisia intricata.....	44	Rectolejeunea Brittoniae.....	54, 56
“ Schimperi.....	44	Rhacomitrium canescens var.	
Pyrenula analepta comb. nov..	41	“ ericoides.....	5
Pyxine sorediata.....	35	Rhizocarpon.....	92-94
Ramalina.....	65, 66, 74	“ geographicum.....	36
“ sect. Corticatae... 66,	67	Rhizogonium spiniforme.....	28
“ Ellipsosporae.....	67	Rhodobryum roseum.....	44
“ series Desmazierae.....	67	Ricasolia.....	39
“ Tenuicorticatae... 67		Riccardia latifrons.....	50
“ Myelopoeae.....	82	“ palmata..... 50, 51	
“ angustissima.....	85	Ricciaceae.....	80
“ calicaris		Riccia arvensis.....	49, 50
“ 81, 83, 89 (Pl. VIII)		“ bifurca.....	49
“ calicaris canaliculata... 83		“ fluitans var. purpurascens. 50	
“ canaliculata 33, 73 (Pl. V.)		“ Huebeneriana.....	50
“ ceruchis 67, 70, (f. 2),		“ Klinggraeffii.....	50
“ 72, 73 (Pls. V, VII)		Ricciella Huebeneriana.....	50
“ ceruchis f. cephalota 67, 71		“ Sullivantii.....	50
“ var. tumidula		Ricciocarpus natans.....	80
“ 67, 71		Rinodina.....	40, 57
“ “ gracilior.. 71		“ angelica.....	64
“ combeoides 67, 72, 73		Roccella.....	83
“ (f. 3), 74, (Pl. VII)		Saelania caesia.....	4
“ combeoides var. robusta		Sambucus glauca.....	1
“ var. nov. 67, 73, 74 (Pl. VII)		Scapania obliqua.....	32
“ crispatula..... 81, 82		Schlotheimia Sullivantii.....	29
“ cuspidata..... 81, 83-85		Scleropodium caespitosum.....	64
“ Duriaei... 66, 74, 81 (Pl. VI)		Scorpidium scorpioides.....	8
“ evernioides			
“ 81, 82, 89,			
“ (Pl. VII)			

Seligeriaceae.....	89	Sphagnum Warnstorffii.....	3
Sphaerocarpaceae.....	9, 10	Sphenolobus politus.....	47, 55
Sphaerophoraceae.....	36	“ scitulus.....	47
Sphaerophorus fragilis.....	36	Splachnaceae.....	5
Sphagnaceae.....	3, 29, 89	Splachnum ampullaceum.....	5
Sphagnales.....	10	Squamaria.....	57
Sphagnum.....	20, 29, 43, 59, 60, 74, 90	Stereocaulon.....	33
“ sect. Acisphagnum.....	59-62	“ paschale.....	34
“ “ Inophloea.....	20, 24, 60, 61	Stictaceae.....	36
“ “ Litophloea.....	61, 74	Sticta dissecta.....	39
“ “ Malacosphagnum.....	20-24, 60, 61, 76	“ dissecta f. corrosa.....	39
“ group Acutifolia.....	60	“ erosa.....	39
“ “ Cuspidata.....	60	Stringula complanata.....	32
“ “ Squarrosa.....	60-62, 76	Swartzia montana.....	4
“ “ Truncata.....	61	Syrrhopodon floridanus.....	28
“ acutifolium.....	3, 44	“ texanus.....	28
“ ngströmi.....	61-62, 76	Tetraphidales.....	10
“ antarcticum.....	24	Thelia.....	28
“ compactum.....	20-24, 76	Theloschistes parietinus.....	48
“ cymbifolium.....	24, 44	Thuidium.....	42, 43
“ domingense.....	22	“ abietinum.....	6
“ erythrocalyx.....	21, 24	“ Blandowii.....	45
“ fuscum.....	3	“ delicatulum.....	6, 45
“ Garberi.....	21-23	“ microphyllum.....	28, 44
“ Girgensohnii.....	3, 22, 61, 74	“ var. Ravenellii.....	28
“ guatemalense.....	24	“ minutulum.....	45
“ humile.....	22	“ scitum.....	44
“ imbricatum.....	24	Timmia cucullata.....	48
“ magellanicum.....	3, 24	Tortella caespitosa.....	17, 29
“ mexicanum.....	22	“ tortuosa.....	5, 28
“ papillosum.....	21, 23, 24	Tortula ruralis.....	5
“ papillosum var. intermedium.....	3	*Ulotia americana.....	5
“ Pappeanum.....	24	Umbilicaria proboscidea f. exasperata.....	56
“ platyphyllum var. sub-simplex.....	3	“ pustulata.....	36
Sphagnum portoricense.....	24	“ “ var. papulosa 36, (Pl. III f. I)	
“ Pylaeii.....	23	Usneaceae.....	33, 66, 67
“ recurvum.....	74	Usnea.....	65, 66, 72
“ var. parvifolium.....	3	“ barbata c. dasypogon.....	96
“ rigidum.....	20, 21	“ florida.....	33
“ robustum var. gracile.....	3	“ longissima ph. tenuis.....	33
“ sparsifolium.....	24	“ plicata.....	16, 33
“ squarrosulum.....	75, 76	“ subfusca.....	33
“ squarrosulum.....	23, 24, 61, 74	“ trichodea.....	33
“ strictum.....	21-24, 76	“ tumidula.....	71
“ tenerum.....	24	Verrucaria laevata var. nigrita.....	59
“ teres.....	3, 21-24, 61, 74-76	Viburnum.....	40
“ var. squarrosulum.....	75	Webera.....	43
		Weisia viridula.....	27
		“ “ var. longisetula.....	27

INDEX TO TITLES

Additions to the Lichen-Flora of Southern California. No. 8. H. E. Hasse.....	1-2	ton.....	11
Annulus, The, of <i>Tortella caespitosa</i> (Schwaeg.) Limpr. E. J. Hill.....	17-18	Collecting Mosses in Florida. A. J. Grout.....	27-29
<i>Brachymentum macrocarpum</i> Card. in Florida, and <i>Funaria rubiginosa</i> sp. nov.* R. S. Williams.....	36-39	<i>Ditrichum rhynchostegium</i> Kindb. Elizabeth G. Britton.....	8
<i>Brachythecium pacificum</i> , New Species.* O. E. Jennings.....	94-96	Editorial. A. J. Grout.....	31-32
Brinkman's <i>Canadian Hepaticae</i> . Caroline Coventry Haynes.....	47	O. E. Jennings.....	48, 64
Bryological Collections of Dr. Emilio Levier. Elizabeth G. Britton.....		Eggs of a Mite in Empty Capsules of <i>Orthotrichum pusillum</i> .* Frank J. Keeley.....	18-19
		Election of Officers of the S. M. S. for 1913, Report of. Mary G. Spencer.....	16

Exchange Department.	
16, 32, 48, 64, 80, 96	
First Supplement S. M. S. Exchange List of <i>Hepaticae</i> found in U. S. and Canada. Caroline Coventry Haynes.....	55-56
Florida Lichens.* G. K. Merrill	39-41
Genus <i>Husnotiella</i> Cardot, The R. S. Williams.....	25
Lichens of Mt. Katahdin, Maine. R. H. Howe, Jr.....	33-36
List of Mosses Collected upon Isle Royale, Lake Superior. William S. Cooper.....	3-8
Meeting of Advisory Board.....	16
Membership of the S. M. S.....	15-16
Mosses of the Vicinity of St. John's University, Collegeville, Stearns Co., Minnesota. James Hanson.....	42-45
Moss Washing Machine.* H. S. Jewett.....	25-27
<i>Musci Acrocarpi Boreali-Americana</i> . Edward B. Chamberlain	31
Necrology—Chester C. Kingman. E. B. Chamberlain.....	31
New and Interesting Lichens from the State of Washington. G. K. Merrill.....	56-59
Ninth Public Meeting of the S. M. S. Annie Morrill Smith... ..	62-64
North American Species of the Genus <i>Ramalina</i> .* Parts I and II. R. H. Howe, Jr... ..	65-74, 81-88
Notes on Current Literature—I. Edward B. Chamberlain....	46-47
Notes on North American <i>Hepaticae</i> . IV.* Alexander W. Evans.....	49-55
Notes on North American <i>Sphagnum</i> . IV and V.* A. LeRoy Andrews....	20-24, 59-62, 74-76
Noteworthy <i>Lecideaceae</i> from Knox County, Maine. G. K. Merrill.....	77-79, 91-94
Notice of Election of S. M. S. Officers for 1914.....	80
Notice of Sullivan Moss Society Meeting.....	47
<i>Plagiothecium geophilum</i> (Aust.) Grout. H. S. Jewett.....	8-9
President's Report. Alexander W. Evans.....	11-12
Remarkable Form of <i>Dicranella heteromalla</i> Schimp. H. N. Dixon.....	29-30
Report of the Curator of the Hepatic Herbarium. Geo. H. Conklin.....	13
Report of the Curator of the Moss Herbarium. Geo. B. Kaiser... ..	14
Report of the Lichen Department. Mary F. Miller.....	14-15
Report of the Treasurer. Annie Morrill Smith.....	12-13
Reviews—Dr. Frank Cavers: Inter-Relationships of the <i>Bryophyta</i> . A. J. Grout.....	9-11
Reviews—North American Flora, Vol. 15, Parts I and II <i>Sphagnaceae-Leucobryaceae</i> . A. J. Grout.....	89-90
Riccia Desired for Naming. M. A. Howe.....	80
Shorter Notes. O. E. Jennings....	96
Slime Mould Growing on a Moss.* George B. Kaiser.....	45

INDEX TO AUTHORS

Andrews, A. LeRoy, 20-24, 59-62, 74-76
Britton, Elizabeth G.....
8, 11
Chamberlain, Edward B..
31, 46-47
Conklin, Geo. Hall.....
13
Cooper, William S.....
3-8
Dixon, H. N.....
29-30
Evans, Alexander W. 11-12, 49-55
Grout, A. J. 9-11, 27-29, 31-32, 89-90
Hansen, James.....
42-45
Hasse, H. E.....
1-2
Haynes, Caroline Coventry
47, 55-56
Hill, E. J.....
17-18
Howe, M. A.....
80
Howe, R. Heber, Jr. 33-36, 65-74, 81-89
Jennings, O. E.....
95-96
Jewett, H. S.....
8-9, 25-27
Kaiser, George B.....
14, 45
Keeley, Frank J.....
17-18
Merrill, G. K. 39-41, 56-59, 77-79, 91-94
Miller, Mary F.....
14-15
Smith, Annie Morrill 12-13, 62-64
Spencer, Mary G.....
16
Williams, R. S.....
25, 36-39

ERRATA

Page 11, line 3, for <i>Plurocarpi</i> read <i>Pleurocarpi</i> .
Page 13, line 11, for Custodian read Curator.
Page 16, line 4, from bottom, for <i>Depanocladus</i> read <i>Drepanocladus</i> .
Page 18, line 4, from bottom, for cap ules read capsules.
Page 18, last line, for hem read them.
Page 22, line 19, for <i>trictum</i> read <i>strictum</i> .
Page 22, line 8, from bottom, for seriou read serious.
Page 28, line 18, for <i>Eurhyuchium</i> read <i>Eurhynchium</i> .
Page 34, line 20, for <i>Sterocaulon</i> read <i>Stereocaulon</i> .
Page 34, 3d line from bottom, for <i>Pseudophysciaceae</i> read <i>Pseudophysciaceae</i> .
Page 35, line 3, for <i>Physiaceae</i> read <i>Physciaceae</i> .
Page 40, line 8, from bottom, for co orless read colorless.
Page 43, line 24, for <i>Blarndowii</i> read <i>Blandowii</i> .
Page 65, 7th line from bottom, for <i>nomina conservanda</i> read <i>nomen conservandum</i> .
Page 67, line 4, for Chapter read Society.
Page 73, line 3, for <i>novo</i> read <i>nov</i> .

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CONTENTS

Amblystegium Kochii	Frontispiece
Additions to the Lichenflora of Southern California	1
A List of Mosses Collected upon Isle Royale, Lake Superior William S. Cooper	3
Ditrichum rhynchostegium Kindb.	E. G. Britton 8
Plagiothecium geophilum (Aust.) Grout H. S. Jewett, M. D.	8
Review: Inter-relationships of the Bryophyta	9
The Bryological Collections of Dr. Emilio Levier	11
Sullivant Moss Society; Reports	11
Membership	15
Meeting of Advisory Board	16
Exchange Department	16

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PLATE I.
AMBLYSTEGIUM KOCHII B. & S.

THE BRYOLOGIST

VOL. XVI

JANUARY 1913

No. 1

ADDITIONS TO THE LICHENFLORA OF SOUTHERN CALIFORNIA. 8

LECANORA PHÆOBOLA Tuck.

The small brown squamules (moistened olive green) composing the thallus are 0.8 to 0.25 mm. wide, their medullary hyphæ not stained by iodine; apothecia sessile to subpedicellate, 0.25 to 1.25 mm. wide, numerous, often covering the small thallus patches; disk concolorous with thallus, from slightly concave becoming convex, smooth or rugulose, shining, the larger ones immarginate. Epithecium continuous, pale brown, 60μ high; paraphyses coherent; hypothecium colorless; asci clavate; spores 8, colorless, simple, oblong-ellipsoid, 8μ to 13μ long, 2μ to 4μ thick, juvenile spores with ends acuminate, the matured more blunted; hymen. gel. with iodine blue then becoming sordid greenish, KHO—; hypothallus indistinct.

On bark of *Lebocedrus decurrens* Torr., at "Pinecrest," San Bernardino Mts. at 1,600 meters altitude. Not unlike *Lecidea*^a (*Biatora*) *dolodes* Nyl. in color, but disks not shining, smaller and the spores are globular.

BACIDIA ENDOLEUCA (Nyl.) Kickx. (*Biatora atrogrisea* (Delis.) Hepp-Tuck. Syn. N. A. Li. 2: 44.

Thallus crustaceous, subdeterminate, light creamy gray, distantly rimulose, surface slightly glistening; apothecia sessile, numerous, scattered or grouped, black, from 0.25 to 1.0 mm. wide; disk at first plane or slightly convex with a thick, prominent, glistening proper margin, later convex and margin almost excluded; epithecium subcontinuous, blackish blue, gradually paling downward; thecium colorless or dingy pale brown, 76μ to 84μ high; paraphyses coherent the tips clavate; hypothecium blackish brown; asci narrowly clavate; spores 8, narrowly fusiform, both ends blunted, but one more gradually attenuate than the other, straight or gently once or twice curved, 8 to 10 septate, but the septa are indistinct, 36μ to 52μ long, 4μ to 5μ thick; hymen. gel. stains reddish with iodine, with NO_5 the tips of paraphyses and asci violet blue.

On *Sambucus glauca* Nutt., Catalina Island.

MARONEA CONSTANS (Nyl.) Th. Fr. **var sublecodeina** A. Zahlbr. var. nov.

Thallus crustaceous, uniform, of minute gray contiguous squamules (greenish gray when moist); hypothallus not conspicuous, black. Apothecia sessile 0.5 mm. wide; disk flat, dull black to brownish with a persistent thin granulose

thalline margin; epithecium granulose-yellowish to pale brownish-gray, gradually paling downward; thecium colorless, 80μ to 84μ high; paraphyses rather loosely coherent, their tips clavate. I have been able to see but few forked above. Hypothecium pallid to colorless; asci inflated clavate to oblong ellipsoid, 72μ to 80μ long, 12μ to 16μ thick; spores numerous, minute, simple, oblong, somewhat contracted in the middle and apparently spuriously two celled or polarilocular, 3μ to 4μ long, 2μ to 3μ thick. Hymen. gel. with iodine blue soon changing to sordid bluish brown, KHO—.

On *Cercocarpus parvifolius* Nutt., Santa Monica range above Sherman. On account of the thin and often insignificant thalline margin, as compared with the species, Dr. Zahlbruckner has made it provisionally a variety. So far as known to the writer *Maronea* has not heretofore been reported from the Pacific coast.

Type variety deposited with Dr. A. Zahlbruckner; the U. S. National Herbarium, Washington, D. C.; the Academy of Sciences of Southern California and in Herb. Hasse.

Dermatocarpon (SECTION ENDOPYRENIUM) **Zahlbruckneri** HASSE SP. NOV.

Thallus crustaceous, uniform squamulose-areolate, grayish with a tinge of red. Squamules more or less aggregate, 0.5 to 1.0 mm. wide, convex, in outline round to oval or angular; upper surface pseudoparenchymatous-corticate, of brown cells, thin (10μ to 12μ) at place of perforation of the perithecium, increasing in thickness to 130μ to 138μ in the interspaces of the one to six perithecia contained in each squamule; the ecorticate lower surface attached by medullary hyphæ to the substratum. Perithecia umbilicately impressed in the thallus, spherical to ovoid, 80μ to 88μ in diameter and 130μ to 138μ deep; the exposed upper part of the perithecium dark brown, the immersed portion light flesh color and soft; gonidial layer subtends the cortex, medulla composed of closely packed hyaline cells; paraphyses gelatinous; asci oblong-ellipsoid and saccate, 72μ to 76μ long, 28μ thick, the membrane gelatinous; spores 8, colorless, simple, narrowly oblong-ellipsoid, 17μ to 24μ long, 4μ to 7μ thick, variously disposed in the asci; hypothecium colorless; spermogones imbedded, enclosed in a pallid sac; spermatia short, straight, fusiform, ellipsoid, 12μ long, 2μ thick; sterigma acicular straight 12μ to 20μ long. Hymen. gel. stains yellow with iodine, ascus membrane and spores do not stain.

On trap rock, Topanga Canon, Santa Monica range.

Externally similar to *D. monstuosum* (Mass.) but differing in its uniform thallus and size of the spores. It is named for Dr. Zahlbruckner, who designated it as a new species. Type deposited with Dr. Zahlbruckner, the U. S. National Herbarium, Washington, D.C.; the Herbarium of the Academy of Sciences of Southern California, and in Herbarium Hasse.

H. E. HASSE

SANTA MONICA, CALIFORNIA.

A LIST OF MOSSES COLLECTED UPON ISLE ROYALE, LAKE SUPERIOR

WILLIAM S. COOPER

The following list is mainly the result of one season's collecting by a beginner in the study of the mosses. To make the catalogue as complete as possible, sixteen species, not seen by the writer, have been added from the report of Mr. W. P. Holt, who collected upon the island during the summer of 1905,* and whose list of mosses includes a total of thirty-eight.

Isle Royale is a large island in the northwestern part of Lake Superior, distant 23 km. from the nearest point of the Canadian mainland. Vegetationally, it is included in the region dominated by the great Northeastern Conifer Forest. The Climax Forest of the island is composed mainly of Balsam Fir, Paper Birch, and White Spruce, and is exceedingly mesophytic in character. The principal lines of succession leading to its establishment are two. The Rock Shore Succession progresses through crustose, foliose and fruticose lichen, crevice, rock pool, heath mat, and xerophytic forest stages to the climax state. The xerophytic forest, not always present, is composed of Jack Pine and Black Spruce. The Bog Succession proceeds through aquatic, sedge, shrub-sphagnum, and bog forest stages, the last being composed of Tamarack, with Black Spruce or Arbor Vitæ or both. Many of the mosses were found to have definite places and rôles in these successions, which I have described in a paper that is now in process of publication in the "Plant World."

For the identification of doubtful specimens and verification of my whole collection, I am indebted to Miss Edith A. Warner, of Brooklyn, N. Y.

Sphagnaceae

1. *Sphagnum acutifolium* Ehrh.
2. *Sphagnum fuscum* (Schimp.) Klinggr.
3. *Sphagnum Girgensohnii* Russ. var. *molle* Grav., Holt.
4. *Sphagnum magellanicum* Brid.
5. *Sphagnum papillosum* Lindb. var. *intermedium* (Russ.) Warnst.
6. *Sphagnum platyphyllum* Sull. var. *subsimplex* (Ldbg.) Holt.
7. *Sphagnum recurvum* Beauv. var. *parvifolium* Sendtn.
8. *Sphagnum robustum* (Russ.) Rl. var. *gracile* Rl., Holt.
9. *Sphagnum teres* (Schimp.) Ångstr.
10. *Sphagnum Warnstorffii* Rußs.

The sphagna are as usual characteristic of the sphagnum-shrub zone of the bogs, and persist frequently into the bog forest.

*W. P. HOLT. Notes on the Vegetation of Isle Royale, Michigan. In "An ecological survey of Isle Royale, Lake Superior," prepared under the direction of Chas. C. Adams. State printers, Lansing, Mich., 1909.

Georgiaceae

11. *Georgia pellucida* (L.) Rabenh. Bog forest, abundant; climax forest, frequent.

Polytrichaceae

12. *Pogonatum alpinum* (L.) Roehl. Climax forest, on rocks and cliffs.
13. *Polytrichum commune* L. Various habitats, usually moist.
14. *Polytrichum juniperinum* Willd. Bare rock habitats; rock shores and burned areas.
15. *Polytrichum ohioense* R. & C. Raspberry Island.
16. *Polytrichum piliferum* Schreb. Bare rock habitats, burned areas and rock shores.
17. *Polytrichum strictum* Banks. Sphagnum-shrub zone of bogs, invading sphagnum, frequent; depressions on rock shores, occasional.

Dicranaceae

18. *Ceratodon purpureus* (L.) Brid. Dry rock habitats, particularly burned areas.
19. *Cynodontium polycarpum* (Ehrh.) Schimp.? Raspberry Island.
20. *Cynodontium polycarpum* (Ehrh.) Schimp. var. *strumiferum* Schimp. Boulders in climax forest near Blake Point.
21. *Dicranella Schreberi* (Sw.) Sch. "Near sphagnum bog at end of cabin trail"—Siskowit Lake. Holt.
22. *Dicranum flagellare* Hedw. Bog, climax, and burn forests; often on rotten wood.
23. *Dicranum fuscescens* Turn. Bog and climax forests, frequent.
24. *Dicranum longifolium* Ehrh. "Woods along Siskowit cabin trail." Holt.
25. *Dicranum scoparium* (L.) Hedw. Bog forest; wet places in climax forest; often on rotten wood.
26. *Dicranum undulatum* Ehrh. Climax forest, common; bog forest.
27. *Leucobryum glaucum* (L.) Schimp. Climax and bog forests, infrequent.
28. *Oncophorus Wahlenbergii* Brid. Bog forest.
29. *Selania caesia* Lindb. Shore rocks. Rock Harbor.
30. *Swartzia montana* (Lamk.) Lindb. Sheltered crevices in cliffs and shore rocks.

Grimmiaceae

31. *Grimmia ovata* Web. & Mohr. Shore rocks, abundant with crustose lichens.
32. *Grimmia unicolor* Hook. Shore rocks. Holt.
33. *Hedwigia albicans* (Web.) Lindb. Shore rocks; to some extent with crustose lichens; very abundant with foliose lichens; also on cliffs and boulders in climax forest and other situations.

34. *Racomitrium canescens* (Timm.) Brid. var. *ericoides* (Web.) Schimp. With *Cladonias* in a "rock opening" in the climax forest; one locality, near Siskowit Lake.

Tortulaceae

35. *Tortella tortuosa* (L.) Limpr. "Rock ridges, and other rocky places." Holt.

36. *Tortula ruralis* (L.) Ehrh. Sheltered crevices of cliffs.

Encalyptaceae

37. *Encalypta ciliata* (Hedw.) Hoff. Sheltered crevices of shore rocks and cliffs.

38. *Encalypta procera* Bruch. Same habitat as last.

Orthotrichaceae

39. *Amphidium lapponicum* (Hedw.) Schimp. Shore rocks at Park Place.

40. *Orthotrichum anomalum* Hedw. Shore rocks with crustose and foliose lichens, abundant.

41. *Orthotrichum speciosum* var. *Killiasii* Sch. Shore rocks at Park Place.

42. *Ulota americana* (Beauv.) Lindb. "Growing on gently sloping rock shore, sometimes covering crustaceous and foliose lichen patches." Holt. It is possible that *Orthotrichum anomalum*, which is very abundant in such places, was mistaken for this species.

Splachnaceae

43. *Splachnum ampullaceum* L. Bog forest.

Funariaceae

44. *Funaria hygrometrica* (L.) Sibth. Dry rocky places and clearings, especially after recent burning.

Meeseaceae

45. *Paludella squarrosa* (L.) Brid. "Bog margin of Forbes Lake." Holt.

Aulacomniaceae

46. *Aulacomnium palustre* (L.) Schwaegr. Invading sphagnum in bogs; bog forest; wet depressions upon rock shores.

47. *Aulacomnium palustre* (L.) Schwaegr. var. *polycephalum* B. & S. Bog forest near Park Place.

Bartramiaceae

48. *Bartramia pomiformis* (L.) Hedw. Boulders and cliffs in climax forest and other sheltered situations.

Bryaceae

49. *Bryum caespiticium* L. Recent burn on Smithwick Island.
50. *Bryum capillare* L. Blake Point.
51. *Bryum inclinatum* (Sw.) B. & S. Climax forest near Blake Point.
52. *Bryum intermedium* Brid. Island near Park Place.
53. *Bryum Muhlenbeckii* B. & S. Rock pools and wet crevices of shore rocks.
54. *Bryum pallens* Swartz. "On dead wood and on thinly covered rock surfaces in woods." Holt.
55. *Bryum pendulum* (Hornsch.) Schimp. Bog forest at Sumner Lake.
56. *Bryum roseum* (Weis.) Schreb. Bog forest.
57. *Leptobryum pyriforme* (L.) Wils. Sheltered rock crevices.
58. *Mnium marginatum* (Dicks.) P. Beauv. Shore rocks near Park Place.
59. *Mnium orthorrhynchum* B. & S.? Shore rocks near Park Place.
60. *Mnium punctatum* L. var. *elatum* Schimp. Bog forest, common.
61. *Mnium spinulosum* B. & S. Burn forest near Park Place.
62. *Mnium subglobosum* B. & S. Bog forest, frequent; climax forest.
63. *Pohlia cruda* (L.) Lindb.? Climax forest near Blake Point.
64. *Pohlia nutans* (Schreb.) Lindb. In a great variety of habitats, most abundant in bog forest; also upon sphagnum in open bogs, and in climax and burn forests.

Leskeaceae

65. *Leskea nervosa* (Schwaegr.) Myr. "Rock shores." Holt.
66. *Pterygynandrum filiforme* (Timm.) Hedw. Climax forest near Blake Point.
67. *Thuidium abietinum* (L.) B. & S. Sheltered cliffs along rock shores; cliffs and boulders in climax forest, common.
68. *Thuidium delicatulum* (L.) Mitt. Boulders and cliffs in climax forest.

Hypnaceae

69. *Amblystegium fluviatile* (Sw.) B. & S. Rock pools on Gull Islands.
70. *Amblystegium Kochii* B. & S. Rock pool margin. Island near Park Place.
71. *Amblystegium varium* (Hedw.) Lindb. Island near Park Place.
72. *Brachythecium oxycladon* (Brid.) J. & S.? Duncan Bay.
73. *Brachythecium rutabulum* (L.) B. & S. Island near Park Place.
74. *Brachythecium velutinum* (L.) B. & S.? Duncan Bay.
75. *Calliargon cordifolium* (Hedw.) Kindb. Bog forest at Sumner Lake.
76. *Calliargon Richardsonii* (Mitt.) Kindb. Very wet depressions in bog forest.

77. *Calliergon Schreberi* (Willd.) Grout. The most abundant and widely distributed moss of Isle Royale. Together with *Hylocomium proliferum* and *Hypnum crista-castrensis* makes up the bulk of the moss carpet of the climax forest. Also common in the bog forest, and frequently found growing over the *sphagnum* of open bogs, preventing its further upward growth. The most abundant moss of the jack-pine-black-spruce forest, gradually replacing the *Cladonias*. Also found in sheltered places upon the rock shores.

78. *Calliergon stramineum* (Dicks.) Kindb. Siskowit Lake.

79. *Camptothecium nitens* (Schreb.) Schimp. Sedge-sphagnum zone of bogs.

80. *Campylium chrysophyllum* (Brid.) Bryhn. Duncan Bay.

81. *Campylium polygamum* B. & S.?

82. *Campylium stellatum* (Schreb.) Bryhn. Bog forest, frequent; rock pool margin.

83. *Climacium americanum* Brid. Bog forest and wet places in climax forest; margins of rock pools.

84. *Climacium dendroides* (L.) Web. & Mohr.? Margin of rock pool. Island near Park Place.

85. *Drepanocladus aduncus* (Hedw.) Warnst. "Bog at end of Siskowit Bay cabin trail." Holt.

86. *Drepanocladus fluitans* (Dill.) Warnst. Bog on Raspberry Island.

87. *Drepanocladus uncinatus* (Hedw.) Warnst. Bog forest, common; climax forest.

88. *Drepanocladus vernicosus* (Lindb.) Warnst. Bog near Siskowit Lake. Holt. A moss, probably this species, found as a fossil in sphagnum masses several decimeters below the surface, Raspberry Island.

89. *Eurhynchium strigosum* (Hoff.) B. & S. Duncan Bay. Smithwick Island.

90. *Eurhynchium strigosum* (Hoff.) B. & S. var. *præcox* (Hedw.) Husnot. Park Place.

91. *Hygrohypnum palustre* (Huds.) Loeske? Shore rocks at Park Place.

92. *Hygrohypnum polare* (Lindb.) Broth. "Protected rock crevices, Rock Harbor." Holt.

93. *Hyloccmium proliferum* (L.) Lindb. One of the three important mosses of the climax forest; also abundant in the bog forest, and occurs occasionally in many other habitats.

94. *Hylocomium triquetrum* (L.) B. & S. Climax forest, frequent; common along its edge and in drier portions.

95. *Hypnum crista-castrensis* L. One of the three important mosses of the climax forest, and the most strictly mesophytic in habitat preference. Occurs also in bog forest and occasionally elsewhere.

96. *Hypnum curvifolium* Hedw.? Park Place.

97. *Hypnum imponens* Hedw. Old burn forest near Forbes Lake, on rotten wood.

98. *Hypnum Patientiæ* Lindb. McCargoe's Cove.
99. *Hypnum reptile* Mx. Park Place.
100. *Plagiothecium denticulatum* (L.) B. & S. Bog forest, common; climax forest.
101. *Plagiothecium turfaceum* Lindb. Same habitat as last.
102. *Scorpidium scorpioides* (L.) Limpr. Sedge zone in bogs.

Neckeraceae

103. *Neckera oligocarpa* Bruch. "Forest road, Washington Harbor; woods." Holt.
104. *Neckera pennata* (L.) Hedw. Climax forest, cliffs and boulders; sheltered shore rocks.

Leucodontaceae

105. *Leucodon sciuroides* (L.) Schwaegr. Boulders and cliffs in climax forest.

Fontinalaceae

106. *Dichelyma uncinatum* Mitt.? "Growing in a pool on small island at upper end of Rock Harbor." Holt.
CARMEL, CALIFORNIA, May, 1912.

DITRICHUM RHYNCHOSTEGIUM KINDB.

In the BRYOLOGIST for November in the additions to the list of mosses of West Virginia published by Prof. Sheldon this species is listed from Cranberry Glades (3743). I have since had the privilege of examining these specimens and cannot see how they differ from *Ditrichum pallidum*. The original description¹ calls for a dioicous species, but the antheridia were found to be in clusters below the perichætium, therefore autoicous.

ELIZABETH G. BRITTON.

NEW YORK BOTANICAL GARDEN, December 4th, 1912.

¹ Revue Bryologique 37: 14. 1910.

PLAGIOTHECIUM GEOPHILUM (AUST.) GROUT

I have found this species at two stations in Ohio. First, I found it fruiting, with the capsules just beginning to cast their lids, Dec. 1 to 5, 1909, growing on clay and shales, on the steep sides of gullies and ravines in open deciduous woods in the neighborhood of Sulphur Lick Springs, Ross County. I cannot say how abundant it was, as it was my maiden collecting trip, and I adhered

strictly to my determination to collect only fruiting specimens, and did not recognize any of the mosses at the time I collected them. Second, I find it here; in "Hills and Dales," just outside of the city limits of Dayton, sparsely scattered over a very limited area, growing on clay and limestone, on the steep sides of gullies and banks of brooks, in open deciduous woods. All I have found here has been within a tract less than one-half mile square, all sterile.

Sulphur Lick Springs, is about fifty miles southeast of Dayton, and about nine miles west of Chillicothe. Both stations present about the same physical conditions. Dayton station is about nine hundred feet above sea level, while the country around Sulphur Lick Springs ranges between one thousand and twelve hundred feet above the sea. Both are in the same geologic horizon, the Upper Silurian, and both are covered with heavy deposits of glacial drift, and with the same type of forest growth.

H. S. JEWETT, M.D.

DAYTON, Ohio.

REVIEWS

INTER-RELATIONSHIPS OF THE BRYOPHYTA

BY DR. FRANK CAVERS

Some months ago the Editor received a complimentary copy of the above pamphlet for review, but a desire for a more complete and thorough examination of the work has delayed the matter until an apology is due Dr. Cavers.

The pamphlet of 210 pp., 6"x9 $\frac{3}{4}$ ", illustrated by 72 figures in the text is a thoughtful and suggestive contribution to the subject indicated by its title. With some exceptions the classification adopted in the *Pflanzenfamilien* of Engler and Prantl are followed.

The *Hepaticæ* including the *Anthocerotales* occupy 151 pages, making a pretty complete survey of that subdivision of the "Bryophyta." Because of their great variety of structure and the perplexing nature of their relationships, 65 pages are given to the comparatively small groups *Sphaerocarpaceæ* and *Marchantiales*.

Dr. Cavers does not accept Howe's view that the *Anthocerotales* are worthy of being elevated to the rank of a class co-ordinate with *Hepaticæ* and disposes of the main distinction on which Howe bases his view, *i. e.* "(i) A single large chloroplast to each cell, instead of several smaller chloroplasts as in the assimilative tissues of the *Hepaticæ* proper; (ii) the antheridia arise within the thallus—are endogenous in origin—and the walls of the immersed archegonia are confluent with the adjacent tissues; (iii) the presence of meristematic tissue in the capsule near its base, by the activity of which the capsule has a long continued growth, ripening spores towards its apex while forming new spore-mother-cells below; (iv) the presence, in probably all cases, of a columella around which the

archesporium is formed; (v) the presence, in many cases, of stomata on the capsule, with accompanying assimilative tissue,"—in the following manner, "From the summary presented here, it will be seen that very little importance can be attached to the first and second of the characters mentioned above. The number of chloroplasts *per* cell varies considerably. The 'endogenous' origin of the antheridia is obviously a secondary character, derived from the normal exogenous type of antheridium development; the antheridia themselves agree closely with those of other *Hepaticæ*, especially *Sphærocarpales*, and though the development of the antheridial cavity is peculiar, it is easier to relate it to what is found in other *Hepaticæ* than to establish analogies with the *Pteridophyta*. In the immersion of the archegonium in the thallus, the *Anthocerotales* do not in reality differ widely from other *Hepaticæ*; the archegonium is partly embedded in *Aneura*, though in this case, the neck is free. The meristematic tissue above the haustorium of the sporogonium in *Anthocerotales* evidently results from the persistence of a stage which is quickly passed through in the development of the sporogonium in other *Hepaticæ*. In *Pellia*, for instance, the cells of the seta are arranged in regular longitudinal rows, owing to repeated transverse divisions in the cells between haustorium and capsule, and we may imagine the sporogonium of the *Anthocerotales* to have arisen through the persistence of the meristematic activity of this zone of tissue, the differentiation of the capsule being deferred and becoming basipetal, instead of taking place early and being simultaneous. The columella of the *Anthocerotean* capsule, again, may be compared with the incomplete sterilization of central tissue which results in the formation of the elaterophore of such forms as *Pellia*, *Aneura*, and *Gottschea splachnophylla*. It is doubtful whether much stress should be laid on the presence of stomata in the epidermis of the *Anthoceros* capsule; this feature is doubtless to be correlated with the development of a many-layered capsule wall consisting of assimilative parenchyma. In various *Jungermanniales*, the capsule wall is many-layered, and when young contains chloroplasts—a condition which persists in the *Anthocerotales*, but is also found in the ripe capsules of forms like *Riella*, where the cells of the capsule wall do not become thickened with fibres in connection with a special dehiscence mechanism."

Dr. Cavers does not believe that the *Sphagnales* any more than the *Anthocerotales* should be given co-ordinate rank with *Musci* and *Hepaticæ*, but suggests that if any departure from the customary division into *Hepaticæ* and *Musci* is to be made, it will be more satisfactory to divide the Bryophytes as a whole into 10 groups of co-ordinate rank as given below,

<i>Sphærocarpales.</i>	<i>Sphagnales.</i>
<i>Marchantiales.</i>	<i>Tetraphidales.</i>
<i>Jungermanniales.</i>	<i>Polytrichales.</i>
<i>Anthocerotales.</i>	<i>Buxbaumiales.</i>
<i>Andreaeales.</i>	<i>Eu-Bryales.</i>

Dr. Caver's treatment of the *Musci* is much less satisfactory to the Editor than that of the *Hepaticæ*. His statement that the old distinction of *Acrocarpi* and *Pluricarpi* must be abandoned for many reasons, one of which is that "Many *pleurocarpous* forms occur among such *acrocarpus* families and genera as *Leucobryaceæ*, *Fissidens*, *Pleuroweisia*, etc." has much force, but when he says "A line may be traced, for instance, from the *acrocarpous Orthotrichaceæ* through intermediate forms like the *Hedwigiaceæ* and *Cryphæaceæ* to such typically *pleurocarpous* forms as *Eurhynchium* and *Hylocomium*" most moss students will be unable to perceive the accuracy of the statement, unless the steps are more numerous than indicated.

The work is well worth the attention of every student of the relationships and classification of the Bryophytes and its quite full bibliography will be of aid in selecting other literature along the same line.

THE BRYOLOGICAL COLLECTIONS OF DR. EMILIO LEVIER

A brief notice of the death of Dr. Levier appeared in the last BRYOLOGIST. His collections of mosses and hepatics are for sale and Mme. Levier has sent me a list of the names of the collectors and the places where they collected and states that the herbarium is estimated to contain 47,000 specimens, in 483 genera, and 12,372 species. Of these, 8,836 are mosses and 3,536 are hepatics. They are unmounted and contained in 120 packages with about 15 others which have not been incorporated. It is a large and a valuable collection. Lists may be had on application to me, also lists of his books for sale.

ELIZABETH G. BRITTON.

NEW YORK BOTANICAL GARDEN.

SULLIVANT MOSS SOCIETY

President's Report

Although the president has played but a small part in furthering the aims of the Sullivant Moss Society during the past year, he is able to report progress and a continued interest in the work on the part of the members. He still recommends the careful collection of material, even in regions which have been more or less explored, and is encouraged by the work of this character which has already been done. The study of variation under different environmental conditions is another field in which valuable results may be expected.

The following year will mark a number of changes in the Advisory Board of the Society, Mrs. Annie Morrill Smith becoming Vice-President in place of Mrs. C. C. Haynes, Mr. E. B. Chamberlain succeeding Mrs. Smith, as Treasurer,

and Dr. H. E. Hasse undertaking the curatorship of the Lichen Herbarium, which has so long been under the charge of Miss Mary F. Miller. Except for the changes involved in the advisory board, the editorship of the BRYOLOGIST will remain the same as during 1912, and the Society is fortunate in being able to retain the services of Dr. A. J. Grout as editor-in-chief. The volume which has just come to a close numbers 100 pages (exclusive of the index) and includes four plates and fourteen figures in the text. Of the twenty-nine original articles published nineteen relate to mosses, six to hepatics, and four to lichens, while one includes all three groups. The articles on mosses have been submitted by twelve contributors, those on hepatics by four, and those on lichens by three, showing that the mosses still represent the chief interest of the members.

The president renews his congratulations to the Society and feels assured that the useful activity of the members will be continued for a long time to come.

ALEXANDER W. EVANS

NEW HAVEN, Connecticut.

Report of the Treasurer

In turning over the treasury to my successor, Mr. Edward B. Chamberlain, the small balance on hand is to be regretted. In explanation, it will be noted that several large expenditures have been made. The long desired reprinting of early numbers, the binding of, and distributing the sets of THE BRYOLOGIST to the three herbaria, and the publishing of the Hepatic List, these items more than wiped out the balance on hand at the beginning of the year. We may, therefore, really congratulate ourselves that so much was done and no deficit incurred.

RECEIPTS

By Cash on hand, December 1st, 1911	\$ 78.78
By Cash Subscriptions, Dues, Sale of Files and Index	311.96
By Cash Miss Haynes extra on Hepatic List Printing	5.40
	<hr/>
	\$396.14

DISBURSEMENTS

To January Edition BRYOLOGIST	\$ 47.60
" March " "	37.00
" May " "	39.50
" July " "	39.50
" September " "	42.40
" November " "	36.55
" Index to Vol. XIV, 1911	18.00
" Reprints of Vol. 2, 1899	40.80
" Cuts for the year	12.00
" A. J. Grout, Postage, Express, and Envelopes	16.19
" Bank Fees and Commissions	3.63
" A. M. S. Postage, Stationery	13.00
" Binding three sets BRYOLOGIST and Expressage	16.68

To Washington, D. C. A. A. S. Announcement Post-cards	3.00
" Mr. Kaiser, Herbarium Supplies	3.95
" Printing 2,000 Hepatic Check Lists	25.40
	<hr/>
	\$395.20
" Cash on hand December 1st, 191294
	<hr/>
	\$396.14

Respectfully submitted,

ANNIE MORRILL SMITH.

Report of the Custodian of the Hepatic Herbarium

During the year many valuable specimens have been given the hepatic herbarium by the members. Two hundred and fifty-one specimens have been added, making the total number in the herbarium two thousand eight hundred and forty-seven. A large amount of material still remains to be determined and placed. Much of this is nearly completed, but not quite available to be included in this report.

Mr. A. H. Brinkman, of Dowling Lake, Alta., Canada, has given more than a hundred packets (not yet included), of his Rocky Mountain collections. Some of them new, all of them rare, additions to the Society herbarium. Moreover during the past season this enthusiastic and indefatigable collector has gathered for us a large amount of material from the vicinity of Banff, Hector, Laggan, Yoho and O'Hara Valleys. This is nearly ready to be placed in the herbarium and will make one of the most notable additions of Rocky Mountain material that the Society has received.

A full report of this collection is promised at an early date.

Miss Annie Lorenz, Mr. C. C. Kingmen, Mr. Geo. B. Kaiser, A. F. K. Krout, Ph.D., Mr. D. Lewis Dutton, Mr. Severin Rapp, Prof. J. M. Holzinger, Mr. Frank Dobbin, Mr. Wm. E. Haydock, Mrs. Mary E. Williams, Mr. E. J. Winslow, Rev. H. Dupret, Rev. David Lillie, all have sent duplicates from their collection.

Dr. H. S. Jewett added nine numbers of Husnot's. *Hepaticæ Galliæ* to his gift of many duplicates of *Frullaniæ*.

Miss Greenwood contributed one of the largest collections of this year, eighty packets from Nova Scotia, Banff, Alta., and Glacier, B. C.

Miss Haynes continues her gift of American *Hepaticæ*, no's. 100-120.

Rev. P. G. M. Rhodes, Kidderminster, England, sent the Herbarium twenty-seven species from Switzerland and The British Isles. These with his gift of last year make a fine representation to accompany MacVicar's Hand-Book.

It is a pleasure to note that the number of contributors is increasing. The quality of the material is also much better, many new and rare species having been added to the Herbarium.

GEO. HALL CONKLIN.

Report of the Curator of the Moss Herbarium*

The moss herbarium of the Sullivant Moss Society now contains 2,895 mounted specimens, which represent 970 species and varieties, belonging to 230 genera. During the past year 698 specimens have been mounted and these specimens have added 221 species and varieties and 42 genera new to the herbarium.

Especial thanks for exceptionally valuable exchanges are due to: A. H. Brinkman, I. Györfy, E. Iishiba, David Lillie, and P. G. M. Rhodes. A set of mosses from England and Switzerland contributed by H. H. Knight were among the most generous and admirably collected specimens received during the entire year. The collections of A. H. Brinkman in British Columbia have also been most valuable and noteworthy. It is to be hoped that during the ensuing year the same interest among these members may be continued and even increased and that other members may be led to take more active part in building up the herbarium. The curator is ever ready to make determinations to the best of his ability and much excellent duplicate material is at hand to exchange with those who will be kind enough to honor the herbarium with their contributions.

GEORGE B. KAISER.

GERMANTOWN, PA., 30 November, 1912.

Report of the Lichen Department*

The herbarium has been enriched by many generous contributions during the year. Special mention should be made of Mrs. Mary E. Williams, who presented us with nearly 200 specimens, collected in Maine, Massachusetts, New York, Pennsylvania, North Carolina, South Carolina, Florida, Tennessee and Lapland.

There are now in the herbarium 1,859 specimens, representing 530 species and varieties. 405 specimens have been added during the year, 65 being new to the herbarium.

During the summer the lichen herbarium has been rearranged according to the classification of Engler and Prantl, which, of course, necessitated a change in the generic and specific names of many of the specimens. The whole herbarium of 1,859 specimens represents the work of about 125 collectors, and contains lichens from nearly all parts of North America, from Europe, Asia, Australia, and some of the islands of the Pacific. Africa and South America are not yet represented.

There are, to my certain knowledge, at least 63 present members of the S. M. S. who have collected lichens, yet how few have offered even *one* species in the BRYOLOGIST! Will not some of these collectors come forward during 1913

* Names of contributors omitted for lack of space.

with voluntary offerings? Such thoughtfulness is always greatly appreciated by the curator.

Owing to the exertions of Mrs. A. M. Smith in our behalf, the lichen department is now the possessor of a complete set of the *BRYOLOGIST*, nicely bound (1898-1911), and unbound copies of the 1912 issues.

Sincere thanks are due Prof. Fink, Prof. Riddle, Dr. R.H. Howe, Jr., Mr. G. K. Merrill, and Dr. Ludwig Scriba, for their kind assistance in naming the lichens.

It gives me great pleasure to announce that the well-known lichenist, Dr. H. E. Hasse, has consented to take charge of the lichen department. To him, and to all those with whom I have been so pleasantly associated for nearly five years, I wish all happiness and prosperity.

MARY F. MILLER,
Custodian

Membership of the Sullivant Moss Society

Additions

Agnes, Sister M., Villa Sancta Scholastica, Duluth, Minn., M. H.	Herre, Albert C., Ph.D., R. F. D. 1, Everson, Wash., L.
Cavers, Dr. F., Pharmaceutical Soc., Bloomsbury Sq. London, Eng., M. H.	Knight, H. H., The Lodge, All Saints Villas, Cheltenham, England, M. H.
Chatterton, F. W., P. O. Box 145, New Haven, Conn., M.	Lehman, Rev. A. E., Scottsdale, Pa., M. H. L.
Davis, Rev. John, 318 N. Seventh St., Hannibal, Missouri, M. H.	Streeter, Mrs. M. B., 113 Hooper St., Brooklyn, N. Y., M.

Changes of Address

Andrews, A. Le Roy, Ph.D., 734 College Ave., Ithaca, N. Y.	Carter, Mrs. R. H., 39 Central Street, Laconia, New Hamp.
Beattie, Rev. F. S., Lincoln, New Hampshire.	Chamberlain, E. B., 18 West 89th St., New York City.

Changes of Address

Dunham, Mrs. H. C., 206 Windsor Road, Waban, Mass.	Nelson, Mr. N. L. T., Goodhue, Minnesota.
Foster, Prof. A. S., Republic, Ferry Co., Wash.	Newman, Rev. S. M., Howard University, Washington, D. C.
Macoun, Prof. John, Sidney, Vancouver Id., B. C.	Waddell, Rev. C. H., The Rectory, Grey Abbey, Co. Down, Ireland.
McConnell, Mrs. S. D., Erie, Pa.	

Deceased—Fletcher, S. W.

Resigned

Carr, Miss C. M.
Croswell, Miss Emily.
Flockton, Miss Margaret.
Lake, Prof. E. R.

Lazell, F. J.
Rondthaler, Miss E. W.
Sanborn, Supt. H. C.
Wight, Miss Dorothy.

Report of Election of Officers of the Sullivant Moss Society for 1913

Whole number of votes cast, 14.

For President—Dr. A. W. Evans, 14.

For Vice-President—Mr. E. B. Chamberlain, 14.

For Secreatry—Mrs. Eva B. Gadsby, 14.

For Treasurer—Mrs. Annie Morrill Smith, 14.

Respectfully submitted,

MARY G. SPENCER,
Judge of Elections.

Meeting of Advisory Board

At a meeting of the Advisory Board held at 78 Orange St., Nov. 30th, Mrs. Smith resigned the office of Treasurer and Mr. Chamberlain was appointed to fill the vacancy as it was then too late to change the ballots. Mrs. Smith was appointed Vice-President in place of Mr. Chamberlain.

Miss Miller's personal affairs not giving her time to continue as curator of lichens, Dr. Hasse has consented to undertake the work.

The Society has a compound microscope and accessories that it will loan to the member who has none and who can offer evidence that he can use it to most advantage.

Exchange Department

TO MEMBERS ONLY—FOR STAMPED SELF-ADDRESSED ENVELOPE

Mr. George B. Kaiser, 524 Locust Avenue, Germantown, Pennsylvania—*Cladonia gracilis elongata* (Jacq.) Flk. From the Catskill Mountains, New York.

Miss Mary F. Miller, Box 203, R. F. D. 4, Station A, Washington, D. C.—*Usnea plicata* (L.) Web. From Switzerland. Collected by the Rev. P. G. M. Rhodes.

Mr. E. B. Chamberlain, 18 West 89th St., New York City—*Ephemeropsis tjibodensis*, from Java, Coll. Fleischer.

Rev. H. Dupret, Seminary of Philosophy, Montreal, Canada—*Drepanocladus scorpioides* (L.) Schimper and *Depanocladus aduncus paternus* (Sanio). Collected near Montreal.

H. S. Jewett, 15 W. Monument Ave., Dayton, Ohio—*Platygyrium repens* (Brid.) B. & S. and *Fissidens subbasilaris* Hedw., both from Dayton, Ohio.

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MARCH 1913

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GEORGE N. BEST, M. D. JOHN M. HOLZINGER, M. S.
ALEXANDER W. EVANS, Ph.D. LINCOLN W. RIDDLE, Ph.D.

and the

Advisory Board Officers of the Society

CONTENTS

✓ The Annulus of <i>Tortella caespitosa</i>	E. J. Hill	17
✓ Eggs of a Mite in Empty Capsules of <i>Orthotrichum pusillum</i> . (Illustrated)	Frank J. Keeley	18
✓ Notes on North American <i>Sphagnum</i> . IV.	A. Le Roy Andrews	20
✓ The Genus <i>Husnotiella</i> Cardot	R. S. Williams	25
✓ A Moss Washing Machine (Illustrated)	H. S. Jewett, M. D.	25
✓ Collecting Mosses in Florida	A. J. Grout	27
✓ A Remarkable Form of <i>Dicranella heteromalla</i>	H. N. Dixon	29
Musci <i>Acrocarpi Boreali-Americani</i> (A Review)	E. B. Chamberlain	31
Chester C. Kingman (Obituary)	E. B. Chamberlain	31
Editorial		31
Exchange Department		32

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All material for identification should be sent to the respective curators, also all
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THE BRYOLOGIST

VOL. XVI

MARCH 1913

No. 2

THE ANNULUS OF *TORTELLA CAESPITOSA* (SCHWAEGR.) LIMPR.

E. J. HILL

Works on bryology show much discrepancy, or even diversity, of statement regarding an annulus in *Tortella caespitosa* (Schwaegr.) Limpr. (*Barbula caespitosa* Schwaegr). My attention was called to this on finding in our dune region last July a moss identical in all respects with this quite common species except that it had a well defined annulus of 1-2 rows of cells. The Manual of Lesquereux and James, and the Musci of Sullivant in the second edition of Gray's Manual, both say, "annulus none." Nothing is said about the annulus in the descriptions of the three species of *Tortella* given in Grout's Mosses with Hand-lens and Microscope. Plate 32, reproduced from the "Bryologia Europea" to illustrate the species, does not show any in the figures of the peristome. Schimper, one of the authors of this work, says of *B. caespitosa* in his "Synopsis Mus. Europ." "*annulus nullus*." On failing to identify the moss with any other *Tortella* or *Barbula* that might have an annulus the description of *T. caespitosa* in Limpricht's Laubmoose was consulted. In this it is stated, that there is an annulus of three or four rows of cells detaching by fragments. This was the behavior in the moss at hand, though I did not find more than two series of cells in any peristome examined. Roth (Die Europ. Laubmoose) says 2 or 3 rows, and more extended examination might have covered this, since the rows of cells in the annulus of many mosses is quite variable. But as both of these authors state, it comes off in pieces. I did not find any part in place after detaching the operculum. Other authorities consulted, who mention the annulus at all, say there is none or leave it to be thus inferred. Husnot (Muscologia Gallica) says, "*pas d'anneau*," Boulay (Muscinées de la France) does not give it in his description of *Barbula caespitosa*, but states that the peristome of this is like that of *B. tortuosa* Web. and Mohr, which is described as without an annulus.

Statements so directly opposite are not a little disconcerting, especially when made by leading bryologists. The species as first described and since given by the majority of authors would seem to have been without an annulus, or if such a character was sought and yet was present it was overlooked. The statement that it has none implies that examinations have been made for this purpose. It may mean that the moss varies in this respect from a peristome without an annulus to one that has 1-4 rows of cells.

It seems to be universally conceded that the moss as found in Europe, on which the descriptions of Limpricht and Roth are based, is the same as that from North America. It was described first by Schwaegrichen in 1811 from specimens collected by Muhlenberg in Pennsylvania. Mosses found in Sar-

dinia in 1826 and afterwards in other parts of southern Europe were referred to it. Brotherus gives the general distribution as southern Europe, Caucasus, Algiers, North America, Jamaica and Brazil (Engler and Prantl. Nat. Pflanzenfam. 13: 397). In his re-examination of the types of Hedwig and Schwaegrichen, Cardot says under *Barbula caespitosa*, "Ne diffère pas de la forme méditerranéenne." (Bull. Herb. Boiss. 7: 304. 1899.) Since the annulus is found in European forms and these are identified with those from America it follows that one should be looked for in American forms. Having found it in the examples from Dune Park I was led to examine those I have from other localities. The majority were not promising, being either too old or too young. One taken in July, 1875, within the present limits of Chicago looked favorable, the capsules ripe and the lid still in place. A capsule was put on a slide under the dissecting microscope, the lid carefully removed and the parts placed under a cover glass and transferred to the stage of a compound microscope. The parts of the broken and detached annulus were readily found. I should hardly expect to see one in place, it comes off so easily, nor find it except in some such way as the above. [This fully accounts for the diversity of statement. Ed.] Evidently it is easily overlooked unless the peristome is carefully manipulated. The moss in this region ripens its spores in June and July and capsules can then be found with the opercula still attached. Schwaegrichen gives August as the time those from Pennsylvania were collected by Muhlenberg. It would be advisable that those who collect this species examine it for the annulus.

CHICAGO, ILL.

EGGS OF A MITE IN EMPTY CAPSULES OF ORTHOTRICHUM PUSILLUM

FRANK J. KEELEY

From the bark of an old willow tree near Wycombe in Bucks county, Pennsylvania, I collected on the 30th of May, 1912, specimens of the moss *Orthotrichum pusillum*, which exhibited curious conditions.

In the first mount I made of this *Orthotrichum* the capsules were either empty or filled with oval spore masses, some of which had escaped in the process of mounting, leaving them isolated in the glycerine jelly. These had not been broken up by the boiling to which they had been subjected in mounting.

They seemed so anomalous, however, that I decided to carefully examine the remaining material. In making some additional mounts I found unopened capsules in which the spores were not aggregated into such oval masses. This indicated that there was something "funny" about the latter.

A little study of unmounted material solved the problem. The moss was infested with small mites; they had selected the open capsules in which to lay their oval transparent eggs. The latter were sufficiently glutinous to cement to them a layer of spores, so strongly adherent that even boiling failed to remove them. Some of the capsules were practically filled with such eggs.



PLATE II

CAPSULES OF *ORTHOTRICHUM PUSILLUM* in which a mite had laid its oval transparent eggs. The spores are shown cemented to these eggs. These drawings were made by Mrs. Eva B. Gadshy from a microscopic mount made by Mr. Frank J. Keeley.

NOTES ON NORTH AMERICAN SPHAGNUM. IV

A. LEROY ANDREWS

The Section *Malacosphagnum* Carl Müller

The plants of this small section present, when once known, a fairly distinct aspect in the field, due in part to a compact manner of growth with branches more or less erect, and more especially to the large size and relative thickness of the leaves together with their washed-out whitish to glaucous green color effect, features which altogether give to plants of this section more the appearance of tufts of *Leucobryum* than is the case with any other species of *Sphagnum*. The plants may, however, even show something of a brownish pigmentation. The essential characters of this section have been indicated in a previous note; with reference to the leaves it may be said that the branch leaves show the border in process of differentiation rather than as an accomplished fact, in that the outer chlorophyll cells form a fairly straight line and that the hyaline cells next within may be extremely narrowed to the point of losing their fibrils or may even be suppressed altogether, so that in places two chlorophyll cells joined form a border much as in *Acisphagnum*. The outer chlorophyll cells show the resorption-furrow as in *Inophloea*. The stem leaves possess the border of several rows of narrow cells with pitted walls characterizing *Acisphagnum*. The perichaetial leaves are particularly irregular, in that they resemble branch leaves more than is usually the case. They are, it is true, larger than normal branch leaves, but they are closely disposed at the base of the weak and short pseudopodium, somewhat spreading rather than closely clasping, generally more or less falcate-subsecund and have a form and areolation but slightly differing from that of the branch leaves. They have, however, a clearly differentiated border of narrow cells with pitted walls and lack the resorption-furrow. The hyaline cells next within this border are narrower, lack fibrils and commonly show a membrane gap in about the center of the inner surface. The stem leaves show in the same way resorption of membrane on the inner surface of hyaline cells, in case these are non-fibrillose, instead of on the outer surface as in *Inophloea*. Antheridia have mostly been noted only on the weaker pendent branches, though Warnstorf now ascribes them to the spreading branches as well, but as the antheridial leaves are in no way differentiated they are extremely hard to find. This section is also distributed widely over the earth.

8. *Sphagnum compactum* De Candolle, 1805. This old name of the species was again saved by Lindberg¹ as against *S. rigidum* Schimper, 1857, the identity being satisfactorily established by the figure of Schwaegrichen² drawn from a specimen sent to Hedwig by De Candolle. Apart from the general characters of the section *Malacosphagnum* already noted, the species is distinguished by the nearly central and nicely included chlorophyll cells of its branch leaves, which

¹ Europas och Nord-Amerikas Hvitmossor 41. 1882.

² Supplement I, pl. III (part). 1811.

cells are small and elliptical in cross section. It is also an interesting species for observations upon pores. The inner surface of the branch leaves shows, *e. g.*, very characteristically the phenomenon of pores arranged in threes in adjacent corners of hyaline cells, already alluded to in case of *S. erythrocalyx*. If these leaves are examined carefully from without and in various sections, the conditions will be found to be as follows: at the point of union of three hyaline cells there is often a common cup-shaped opening, amounting to $\frac{1}{3}$ or $\frac{1}{2}$ the thickness of the leaf; from the sides of this cup round pores enter each of the three cells. Viewing these last pores from without the leaf one sees them at an acute angle, which accounts for their often apparently narrowed shape and probably also for the fact that Warnstorf¹ speaks of them as "pseudopores" and I suspect also for Russow's statement² that the common walls of adjacent hyaline cells are perforated, allowing communication with each other. His explanation of how this condition must have come about shows how near he was to appreciating the real condition of things. ¶ That there is such intercommunication of hyaline cells at points where there is not at same time communication with the outside, *i. e.*, at points other than in cell corners I have not been able to demonstrate and see no reason to believe. The same arrangement is present in other species, of those already mentioned notably in *S. erythrocalyx* where Warnstorf again calls the pores pseudopores, and less strongly marked in *S. papillosum* where Warnstorf does not make this mistake, and in fact in other species of *Inophloea* as well. In all these, however, it occurs on the other (outer) surface of the leaf. On the outer surface of the branch leaves of *S. compactum* the phenomenon of pseudopores is especially marked, *i. e.*, along the commissures of the hyaline cells one sees rows of markings suggesting elongated pores, but without puncture of the cell membrane, the so-called fibril bands being reinforced by cross connections in a way admirably described and figured by Russow.³ They are sometimes well represented on the inner surface also and may be somewhat reduced on the outer. The plants fruit not uncommonly and appear, at least in some cases, to be monoicous, but further observations upon the antheridia are desirable.

The species occurs under a variety of conditions in Greenland and along our eastern coast from Labrador to Florida and Alabama, on the western from Vancouver Island, northward to Alaska (Warnstorf accredits it to California, *leg.* Bolander,⁴ but all of Bolander's specimens from California labeled *S. rigidum* which I have seen are *S. teres*). Inland it is much less common and further stations for it should be noted. It is similarly distributed in Europe and Asia and appears then to be confined to the northern hemisphere where it does not quite reach the tropics, but to the northward vies with the hardiest species.

9. *Sphagnum strictum* Sullivant, 1846. This closely related species has long passed under the name *S. Garberi* Lesquereux & James, 1879, until Warnstorf in

¹ Pflanzenreich 51: 146 and elsewhere.

² Zur Anatomie der Torfmoose 18; *cf.* *pl. V.* fig. 58.

³ Ibidem *qf. pl. I.*, fig. 3, *pl. V.*, fig. 61. The phenomenon had of course been noted long before.

⁴ *Cf.* also Lesquereux & James, Manual 17.

his recent monograph¹ reduced it to synonymy with an earlier *S. mexicanum* Mitten, 1869. In his identification of these two species Warnstorf is certainly right. But the species in question has two earlier names: *S. humile* Schimper, 1856 and the one I have adopted. The identity of *S. humile* with our species has already been adequately developed by Cardot,² who noted that Sullivant's plate and description³ from the type specimen collected by Rugel at Tallahassee, Fla., could not well be anything else than *S. Garberi*. That a bit of *S. molle* was mixed with the specimen, as is frequently the case with specimens from Florida, is not impossible and is in fact indicated by the fig. 12 as compared with 14, but the correspondence of most of the figure and of the description with the characters of our species shows clearly enough which of the two the author had primarily in mind.⁴ Warnstorf's reduction of *S. humile* to synonymy with *S. molle*⁵ rested upon a specimen collected by Lesquereux in Carolina and is consequently of no value, as Cardot has noted. I have examined two portions of type material of *S. humile* in the Sullivant Herbarium at Harvard University, both received from Schimper, and both are entirely identical with *S. Garberi*. Warnstorf seems also now to have recognized the facts, but for some reason cites the name, *S. humile*, merely as a synonym of the later *S. mexicanum*.⁶ As to *S. strictum* Sullivant, it was based upon a specimen from Devil's Court House in North Carolina and issued as No. 201 of its author's Musci Alleghenienses. The inadequacy of the original description doubtless accounts for its passing into oblivion as a synonym of *S. compactum*.⁷ The specimens are, however, entirely identical with what has passed as *S. Garberi* and the restoration of the early name, as it seems to me is a decided gain. I have examined the plant in several sets of Sullivant's exsiccata, including that in his own herbarium, which would, I suppose, constitute the type if there were any question. *S. strictum* Lindberg, 1872, being a synonym of *S. Girgensohnii* Russow, 1865, and later than *S. strictum* Sullivant, can present no serious obstacle. As to the remaining synonym, *S. domingense* Carl Müller, 1898, from specimens collected by Eggers in Santo Domingo in 1887, I have not myself seen it, but it was reduced by Warnstorf already before its publication⁸ to synonymy with *S. Mexicanum*, where he still retains it, and I know of no reason to doubt the correctness of the reduction.

The species is very near *S. compactum*, so much so that its value has been called into question, notably by Cardot⁹, but has maintained itself and is, it seems to me, clearly distinct. It is usually a taller plant with elongated spreading or

¹ Pflanzenreich 51: 144. 1911.

² Répertoire sphagnologique 300f. 1897.

³ Icones Muscorum 5. pl. III. 1864.

⁴ It should be noted, however, that Sullivant in an earlier allusion to *S. humile* (Memoirs Amer. Acad. Arts and Sciences, New Series, Vol. IV, Part I, 174f, 1849) described its leaf section incorrectly, as he did also that of *S. strictum*.

⁵ Bot. Gaz. 15: 226, and Hedwigia 29: 209. 1890.

⁶ Pflanzenreich 51: 144. 1911.

⁷ It was in fact reduced by Sullivant himself, Gray's Manual 611. 2 ed. 1856.

⁸ Hedwigia 29: 247. 1890.

⁹ Révision 11. 1887.

squarrose leaves, though the Florida specimens are commonly much reduced in size and *S. compactum* may itself take on robust forms with squarrose leaves. The stem is usually greenish yellow rather than brown, the stem leaves show a tendency to hemisophylly, the branch leaves give the really distinctive character, showing chlorophyll cells exposed on outer surface, while the walls of the hyaline cells, where overlying these, are finely papillose, a condition first noted by Warnstorf¹. These papillae are considerably finer than in the case of *S. papillosum* and may readily escape notice but will generally be seen if carefully looked for. In the Florida specimens they are often reduced or lacking. The pseudopores found in the leaf of the last species are normally entirely lacking in this, while the real pores on the outer surface may be considerably more numerous, though their number is variable and they are in some cases almost entirely absent. The plants are dioicous so far as known and they do not often fruit, though the compact forms from Florida form something of an exception in this respect. The perichaetial leaves are less strongly falcate-secund than in the last species and have a greater contingent of non-fibrillose hyaline cells within the border. I also find a difference in the size of spores, those of this species running mostly $35-45\mu$, while those of *S. compactum* are generally $24-28\mu$. Specimens recently determined by Warnstorf show a confusion of the two species, but one hardly justified by the plants themselves. Of the two numbers (121, 122) in Eaton & Faxon's Sphag. Bor. Amer. Exsic. distributed as *S. Garberi*, No. 121 is in part *S. compactum*. In several sets recently examined only the latter species was found, but in my own set, for which I am indebted to the kindness of Dr. Geo. E. Nichols, both species are present but distinguishable, as always, even macroscopically.

The distribution of *S. strictum* is peculiar, its stations mostly relatively remote from each other suggesting survivals of a former more general distribution, as is the case with *S. Pylaesii*. They stretch in North America from Newfoundland (or Labrador?) southward to Florida and Alabama with the single reported station in Santo Domingo and that in Mexico well southward in Oaxaca and at high altitude. I have also seen a second Mexican specimen in the herbarium of the Copenhagen Botanical Garden collected by Liebmann (Musci No. 10) and named by Schimper *S. squarrosus*. Warnstorf also reports a single station from Ecuador in South America² and in Europe it is known as yet only from the western coast of Norway, where it was collected by Kaalaas in 1889, but remained unidentified until seen by Jensen in 1902.³ It is there confined to the strip of coast and islands characterized by the interesting "Atlantic flora," where I had the pleasure of observing it in quantity while collecting with Kaalaas in Söndmøre in the summer of 1907. In the summer of 1912 I saw it again at Os (Osören) south of Bergen. These field observations tend to confirm me in the opinion that it is a good species, as, though *S. compactum* was generally present

¹ Hedwigia 29: 246f. 1890.

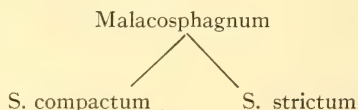
² Pflanzenreich 51: 145. 1911.

³ Cf. Kaalaas, Bryophyten in Romdals Amt 44. 1911.

in the same localities, we saw nothing at all suggesting intergrading forms, the tufts of *S. strictum* being immediately recognizable after we had once distinguished it. In fact Herr Kaalaas became very adept at recognizing the tufts at a considerable distance by the color alone, which he describes as a "bluish-white" or "bluish-green;" I should call it a whitish or slightly greenish straw-color. In the field it is more likely to be confused with *S. squarrosus* than with *S. compactum*.

Two further species of *Malacosphagnum* had previously been accredited to North America: *S. sparsifolium* Warnstorf, 1894, and *S. guatemalense* Warnstorf, 1890, the former from Guadeloupe, the latter from Guatemala. Warnstorf notes now, however, that *S. sparsifolium* was apparently from Africa¹ and accuses Cardot (1897) of citing the wrong locality for it, but Warnstorf had himself described it as from Guadeloupe.² It appears, then, in Warnstorf's latest work as a variety of *S. Pappeanum* Carl Müller, 1849, an African species whose description reads suspiciously like that of *S. strictum*. *S. guatemalense* its author has found³ to be a synonym of an interesting species, *S. antarcticum* Mitten, 1859, occurring in the region of Australia and New Zealand, from which region the specimen evidently came instead of from Guatemala.

Phylogenetically *S. strictum* is apparently not a derivative of *S. compactum* nor is the opposite the case, as is shown both by characters and distribution, but their relation is quite analogous to that between *S. magellanicum* and the collective *S. papillosum-erythrocalyx*, viz.:



Both are evidently old species, as were those of *Inophloea*.

To the previous notes upon *Inophloea* may be added that I have seen portions of the types of both *S. portoricense* and *S. imbricatum* in the Sullivant Herbarium at Harvard University, that the same herbarium contains a specimen of *S. portoricense* with antheridia sent by Austin, the antheridia being borne essentially as in other species of *Inophloea*, and finally that *S. erythrocalyx* was found in New Jersey before Eaton's time, a specimen in the Sullivant Herbarium from Austin bearing notes of this keen observer and the query whether it was not *S. tenerum*. Sullivant regarded it as a state of *S. cymbifolium*, with which Austin later agreed. The locality given for it is "Pines of New Jersey."

ITHACA, N. Y.

¹ Pflanzenreich 51: 152. 1911.

² Hedwigia 33: 320, 334. 1894. In Engler & Prantl (l. 3: 254. 1901.) Warnstorf still had Guadeloupe as the sole locality for it.

³ Pflanzenreich 51: 157.

THE GENUS HUSNOTIELLA CARDOT

R. S. WILLIAMS.

This genus of the Pottiaceae was based on a moss collected by C. G. Pringle in the State of Mexico where it was found growing on walls of masonry. It was also collected by Barnes and Land on masonry and brick walls and on or near the brick borders of a flower bed with more or less earth about it. This last collection is called a form of the others and has rather longer, straighter leaves. The genus is described as having no peristome and is compared with *Gyroweisia*, from which it is certainly distinct, as pointed out, by the revolute leaf border. Two species are included, *H. revoluta* and *H. Palmeri*, both of which on careful examination show a more or less developed peristome, consisting of a rather delicate membrane scarcely projecting above the rim of capsule and often bearing irregular teeth extending to a little above the more or less persistent annulus. The peristome is much like that of *Didymodon mexicanus*, but not quite so well developed, and in view of this fact and also that the leaves are just about those of a *Didymodon* I scarcely see how the genus can be maintained as distinct. Moreover *H. Palmeri* seems to be only a slightly better developed form of *H. revoluta*, with, on the average, a little longer, more pointed leaves. In both collections specimens occur with leaves precisely alike both in size and leaf apex; cross sections of leaves also show no differences.

I believe the plants should be known as follows:

Didymodon revolutus (Card.) R. S. W. COMB. NOV.

Husnotiella revoluta Card. Rev. Bryol. **36**: 71. 1909.

Husnotiella Palmeri Card. Rev. Bryol. **37**: 121. 1910.

In this connection I may add that *Didymodon stenopyxis* Card. Rev. Bryol. **36**: 84. 1909, is certainly not distinct from *D. aeneus* (C. M.) Besch. Both, sometimes at least, have dioicous flowers.

NEW YORK BOTANICAL GARDEN.

January 2, 1913.

A MOSS "WASHING MACHINE"

H. S. JEWETT, M. D.

"Praeparire sauber! Rasen, denen viel Boden anhaftet, sind an Ort und Stelle auszuwaschen." (Limpricht Laubmoose, I: 70).

The frequently occurring cases, in which it was impossible to carry out the above sound advice, with the resulting pats of mud, where there should have been a beautiful moss specimen, caused me to seek a more certain method of getting rid of the dirt; one that would require neither squeezing nor much handling, thus obviating mutilation and at same time be applicable to the most delicate plants. In this attempt I have been so successful that I now publish it and give to all lovers of mosses the right to make, use, or improve upon my idea without other cost to them than that of making or having it made for them.

The principle is a combination of a support for the moss and a stream of spray to remove the dirt. It is made as follows: Prepare two shallow sieves, of any size desired (mine are eight inches square), of copper screen, flyscreen

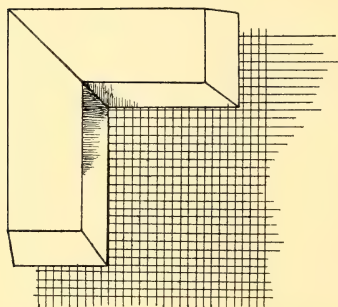


FIG 1.—Detail of corner of screen reduced.

of 14 meshes to the inch is probably the best and is procurable everywhere. Make two frames of hard wood, one-fourth to three-eighths inch thick by one inch wide. Bevel one edge (the one which is to become the inside of the frame) and fasten the screen to the wider side of the frame, so that the frame slopes inward to the screen, thus avoiding corners where loose plants can hide and making the screen more easily cleaned. The object of the frame is to prevent loose plants from floating away, and also to make the screen easy to handle. For very small mosses the screen

should be finer, thirty, forty or fifty meshes to the inch or still finer if desired, though minute mosses must be washed with great care or they will vanish through the screen with the dirt.

Next get a "spray nozzle" and have it fitted to one end of a piece of strong rubber tubing or garden hose, the other end of which is fitted for being attached to the city water supply faucet, either by screwing on, or slipping over and tying. Mine I fitted to a garden hose-coupling so that I can use it as a hose nozzle or screw it on to any faucet fitted for the attaching of hose.

There are many spray nozzles in the market, intended for use with machines for plant spraying against insect depredations, for whitewashing, etc., and they are all essentially the same, but as they are intended for use with liquids containing sediment the opening at the point is too large for our purpose as the spray is too coarse and cone of spray is too wide. The Lowell Specialty Company, of Lowell, Michigan, sends out nozzles with its two-gallon hand tank apparatus which are very easily changed so as to be adapted to this purpose. The distal end of these nozzles is flat with a hole in the center; have this hole closed by soldering a piece of 14 gauge sheet brass over it, then drill a new hole in the center with a number sixty-five twist drill and carefully remove from both sides of the hole any burrs that were left by the drill, and the nozzle is ready to be fitted for attaching to your faucet. The nozzle thus changed throws a very narrow cone of fine spray. The moss is laid on a screen, soil side upwards, and held under the spray—the nearer you hold it to the nozzle the more concentrated is its action, the further away from the nozzle the more gentle. When leaves, pebbles, twigs, etc. make their appearance they must be removed with forceps as they prevent the spray from reaching the dirt under them. When the bottom is clean, lay the other screen over the moss, turn over and hold under the spray, when the moss will leave

the first screen and you finish the moss from the top. After washing both sides place the moss on any absorbing pad, and when the water has been absorbed it is ready for final arrangement and drying.

The dirt may be thus removed from patches of protonema bearing small mosses like *Ephemerum* leaving it like a piece of fine green veiling, but minute gregarious mosses must be washed with great care on a fine screen.

The apparatus can be used in any bathroom, by doing the washing over a basin or other wide dish and emptying the basin into a bucket as soon as it gets full. After standing a few minutes the water can be decanted from the mud into the water closet bowl, and at the end of the work the mud carried out and emptied into the ash can. I have thus used mine over the stationary tubs in the laundry.

Old herbarium specimens can be cleansed almost as well as fresh ones by first softening them thoroughly in a basin of warm water; but! if fruited and the operculum is still on the capsules, remember!! *that if you wet them they will probably cast their operculi*, hence it is best *not to wash or wet operculate mosses after they have once become dry*.

Sterile or non-operculated mosses will not be injured by the process.

DAYTON, OHIO.

COLLECTING MOSSES IN FLORIDA

A. J. GROUT

It was my good fortune to spend Holy Week in April, 1911, in Florida, and my still better fortune to spend it with one of our members, Mr. Samuel C. Hood, at Orange City. Mr. Hood has for some time been in charge of the government food and drug plant experimental farm at Orange City and knows the ways of the country thoroughly and, in addition, he put himself, his motor boat and his horse at my disposal. This made it easy to accomplish much more than would have been possible otherwise. My plans included a visit to another member who has done notable work in bryology, Mr. Severin Rapp, at Sanford, but unavoidable circumstances prevented.

There are two quite distinct sets of conditions, each of which produces a moss flora peculiar to itself. The greater portion of the country in this vicinity consists of sand plains, originally covered with long leaf pine, but now largely grown up to scrub of various sorts. Mosses in this area are few and usually scanty.

Along the St. Johns River and its tributaries with their low lying mucky shores and innumerable connecting swamps and "dead rivers" or lagoons, there is a rich moss flora of an entirely different type.

In the sand plains one finds an abundance of *Ditrichum*, especially *D. pallidum* (Schreb) Hampe. and *Weisia viridula* (L.) Hedw., much of which is the var. *longiseta* (L. & J.), for common northern species are often so modified here as to be scarcely recognizable yet the intergrading forms between the north and south

are so abundant and complete as to make it advisable to consider many of these southern modifications as varieties rather than species.

I expected to find many forms of *Bruchia*, *Pleuridium* and *Dicranella*, but not one was found in fruit except *D. heteromalla Fitzgeraldii* (R. C.) Grout.

Where the sand is rather moist and contains some vegetable matter or lime *Thuidium microphyllum* (Sw.) Best. and its var. *Ravenellii* S. & L. are very abundant, also several species of *Bryum* including the pretty, easily recognized *B. coronatum*. *Funarias* are not rare, but *F. flavicans* Mx. seems as frequent as *F. hygrometrica* and its common variety *patula* B. & S. *Macromitrium rhabdocarpum* Mitt. grows on shade trees, reminding one of *Orthotrichum* or *Drummondia*.

Around the bases of trees in rather moist sandy woods is an exceeding abundance of *Octoblepharum albidum*, *Leucobryum sediforme* and *Plagiothecium micans* (Sw.) Paris. This is equal in variability and richness of forms to any of the *Drepanocladii* (*Harpidia*). It is found on logs, roots and moist soil. In dry places it is in thin mats of short dense-leaved stems and branches; in wet places it becomes long and lax and slender. After a few days one gets so that any small yellow-green moss with *Hypnum* facies is rejected as only another *micans*. *Eurhyuchium serrulatum* (Hedw.) Kindb. a much larger moss, but of a similar color and a *Plagiothecium* habit is also frequent. In such localities there is sure to be a great abundance of *Raphidostegium adnatum* (Mx.) B. & S. on the lower parts of tree trunks. This is easily recognized by its *Pylaisia*-like appearance. *R. Kegelianum* (C. M.) R. & C. var *Floridanum* R. & C. is to be found in such places, but I missed it, though both Mr. Rapp and Mr. Hood have collected it.

Here also the tawny green masses of *Syrrophodon floridanus* Sulliv. are frequent, resembling *Tortella tortuosa*, but rather darker in color and fruiting more frequently. Occasionally on dead logs and stumps is found the much smaller *S. Texanus* Sulliv. with its frequently gemmiferous leaves.

Here and elsewhere one notices the absence of *Mniums*. The large slender *Rhizogonium spiniforme* (L.) Bruch, usually sterile, being almost the only one of the *Mnieae* I saw. It was growing on black, shaded, wet soil, a typical *Mnium* habitat, but is more frequent on palmettoes according to Mr. Hood. *Leptotheca Wrightii* Sulliv. growing on wood also occurs, but I did not collect it. Its capsules look like those of a very large *Thelia*.

But it is the deep shaded cypress swamps that delight the heart of a bryologist. Here the mosses grow on the damp trees logs and stumps, in a profusion almost equal to that of the northern mountains, but are much less profuse on the soil. But while the mosses seem as abundant, the number of species is surely much smaller as a rule. I had heard so much about snakes, particularly the water moccasin, that at first I kept a sharp lookout around and about, for they frequently climb trees, but hogs had been turned out to run wild by the settlers and they had pretty nearly exterminated the snakes. The hogs were not razor backs either, but civilized porkers such as you might see in a New England barn yard, or at least such was the case with a sow and three day old litter I scared out of a nest under the banks of the St. John's River.

It was rather early and cool for mosquitoes, but there were numerous large

black fellows seemingly twice as big as the largest Jerseyite. But friend Hood had concocted an aromatic "Skeet Skoot" that I placed on my hat and coat sleeves which rendered me immune. So effective was it that I hope it may be offered to the world for the relief of the many long-suffering sea shore vacationists and mountain campers.

In these swamps the cypress knees, stumps and dead logs are well covered with mosses as is also the bark of most of the other trees. Here are found *Fissidens subbasilaris* Hedw., very common, also *Forsstroemia trichomitria* (Hedw.) Lindb., and its var. *immersa* (Sulliv.) Lindb., which seems to me to be worthy of specific rank.

On the wet wood in and around the water *Amblystegium floridanum* R. & C., *Cryphea glomerata* B. & S., *Entodon seductrix* (Hedw.) C. M., and *Leskea microcarpa* are frequent. *Schlotheimia Sullivantii* Muell, *Fissidens incurvus* Schwaegr, *Papillaria nigrescens*, *Forsstroemia floridanus* (Lindb.) Kindb, *Tortella caespitosa* (Schwaegr.) Limpr., *Amblystegium varium* (Hedw.) Lindb., *A. irriguum* (Hook. & Wils.) B. & S., *Clasmatodon parvulus* (Hampe) Sulliv. are occasional.

If one is fortunate he will pick up *Fissidens Donellii* Aust., *F. Garberi*, L. & J. and *Entodon Drummondii* (B. & S.) J. & S. *Sphagnum* appeared to be less abundant than in our northern bogs, and only occasional masses were noticed, but I am informed on good authority that this is not typical and that Florida has a very rich *Sphagnum* flora.

*A REMARKABLE FORM OF DICRANELLA HETEROMALLA Schimp.

By H. N. DIXON, M.A., F.L.S.

IN May of this year, Mr. C. P. Hurst sent me a gathering of *Dicranella* which presented a very unusual appearance. The foliage was unmistakably that of *D. heteromalla*, but the capsules were quite unlike those of that species. Instead of being elongate, castaneous brown, inclined, and plicate when dry, on long straw-colored setæ, they were short, small, deep reddish brown, almost erect and symmetrical, smooth when dry, wide-mouthed, and on very short, red, often deep red, setæ, so as to be almost immersed in the tufts. They presented indeed very much the appearance of the fruit of *D. varia*, and this was enhanced when, as was occasionally the case, the peristome, just expanded, showed the long, deep purple teeth characteristic, of some forms especially, of that species. There seemed to be a good *à priori* case for a hybrid form, viz., *heteromalla* ♀ × *D. varia* ♂. Careful search by Mr. Hurst, however, entirely failed to detect the presence of *D. varia* in the immediate vicinity, while on the other hand it showed that the fruiting plant in question covered a much wider range than was at first supposed.

The abundance of capsules, the apparently constant absence of *D. varia* in association, and the great quantity of the male plant of *D. heteromalla* present, made it pretty clear that the hybrid theory must be abandoned, and some other explanation sought. This was confirmed and indeed demonstrated by some of the later gatherings sent me by Mr. Hurst. For not only did many intermediate forms occur between the extreme form as described above and normal *heteromalla* setæ and capsules, but on one or two tufts I found, side by side with the abnormal capsules and on the same stems, setæ of last year's fruit exhibiting no difference from ordinary *heteromalla*; while later on, tufts gathered in July presented young setæ of the present year which were evidently on the road to become the normal, elongate, pale yellow setæ characteristic of the normal plant.* Clearly, therefore, the peculiar capsules represent a state or form merely, and that not so much a local as a temporary state, due, one would suppose, to some climatal conditions. What these may have been, however, I cannot suggest. The abnormal capsules appeared to mature principally about the end of May and early part of June. Midwinter is the usual maturing time for the species, but it varies greatly, and I do not think the simple fact of retardation would be itself sufficient to account for the results. The extremely hot and dry April of this year is perhaps the most marked meteorological feature of the fruiting period of the plants in question; but it is evident that, for capsules ready for deoperculatation in May, the setæ must have been fully developed long before the late spring of this year, and as the most, or one of the most, noticeable deviations from the normal is presented by the seta, the cause must be looked for at some far earlier stage. The setæ of next year's capsules were showing well above the shoots when gathered in early July this summer, and if the plants were in a similar stage of development last July, the suggestion may be hazarded that the extreme heat and drought of that period of 1911 may have been the predisposing cause, followed by an arrest of development which only allowed of maturing late this spring.

I scarcely think that the density of the plants can be the cause, as Mr. R. S. Williams suggests, of the want of development of the fruit. For one thing, the setæ of the previous year, and also those at present developing, show, with the same conditions to density, no variation from the normal. Moreover, I should not consider the plants to be unusually close in their growth.

I should perhaps have remarked that, though in the more or less erect and symmetrical capsule our plant comes near the var. *orthocarpa* (Hedw.), the character of the seta and other considerations preclude its being placed under that variety.

* Since the above was in type I have received further specimens from Mr. Hurst, gathered on Burrigge Heath, in abundant and quite normal fruit of the present year, and still retaining many of the abnormal capsules here described.

MUSCI ACROCARPI BOREALI-AMERICANI

The thirteenth fascicle of Prof. Holzinger's series has just come to hand, and indicates that the author is still keeping the issues up to the high level previously set. The present fascicle comprises numbers 301-325, and contains not a few rarities; among which are *Eucladium verticillatum* c. fr., *Cynodontium torquescens*, *Ditrichum Schimperi*, *Barbula semitoria*, *Bryum camptoneuron* from the type station, *B. floridanum*, and *Aulacomnium turgidum*. The fascicle also contains four species from the Island of Jamaica, collected by members of the staff of the New York Botanical Garden, marking the first appearance in this series of West Indian collections. No serious student of the North American moss flora can afford to be without this series.

EDWARD B. CHAMBERLAIN.

CHESTER C. KINGMAN

We feel sure that all the members of the Sullivant Moss Society will learn with sorrow of the death of Mr. Chester C. Kingman on January 30th, last, at the early age of forty years. Owing to the short time that intervenes before the *BRYOLOGIST* goes to press, it is impossible to give more than a brief notice.

Mr. Kingman became a member of the Sullivant Moss Society in 1908 and at once entered into the work of the Society with enthusiasm. He had always been fond of botany, being especially encouraged in this by his friendship with the late G. E. Davenport. About six years ago he took up the study of the hepatics, then became interested in mosses, and finally, while in California, collected lichens as well. He was an untiring collector and made many interesting discoveries, especially while in the West, as the specimens contributed by him to Prof. Holzinger's *exsiccati* testify. Besides collecting for himself, he exchanged widely and in this way built up a valuable collection of mosses, hepatics, and lichens. The past year he had returned to his Massachusetts home and had brought together the various parts of his collections preparatory to more serious study.

Those who were so fortunate as to have correspondence with him will miss greatly his letters, telling of new finds and characteristically enclosing some of the more precious of the latter; but most of all they will miss his kindly enthusiasm and uniform courtesy.

E. B. C.

EDITORIAL

CHANGE OF EDITORS—Dr. Otto E. Jennings, of the Carnegie Museum, has very kindly consented to relieve the present editor, who two years ago took up the work reluctantly because of the pressing demands of other duties. Speaking personally I wish to thank the associate editors and members of the society for the help and support they have given me.

For the first time in the history of THE BRYOLOGIST there is a shortage of manuscript, and I would urge our members who have available material, that they prepare it as soon as possible and forward it to Dr. Jennings. The students of lichens have not contributed as much in proportion as the students of mosses and hepatics and should now begin to "get busy."

In order to put THE BRYOLOGIST on a firm financial basis we need at least twenty-five new members, and I feel sure they could be secured easily by a little personal effort. Unless this be done there will soon be a shortage entailing certain undesirable results which do not need to be mentioned here.

The Society is fortunate indeed in having so competent a man as editor, and all should turn in and help in every possible way.

A NEW TITLE PAGE for Vol. XIV has been printed and distributed to some, eventually it will be sent to all. The present envelopes are too small to receive it without folding.

CLOSE TRIMMING.—The weight of THE BRYOLOGIST untrimmed and in a large envelope is over 2 oz., and takes two cents for foreign postage. The extra cent makes an item of about ten dollars for the year. Trimmed to fit a 6 in. by 9 in. envelope snugly it will go for one cent. The last issue was unfortunately trimmed a little too close.

JAN. NUMBER LATE—Some members received their January numbers very late due to a shortage in the supply of envelopes.

A. J. G.

EXCHANGE DEPARTMENT

To Members Only—For Stamped Self-addressed Envelope.

Mr. George H. Conklin, 1204 Tower Ave., Superior, Wisconsin—*Scapania obliqua* (Arnell) Schiffn. *Diplophyllum albicans* (L.) Dumort. Flora of Wales, Herb. of Rev. P. G. M. Rhodes.

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MAY 1913

THE BRYOLOGIST

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Advisory Board Officers of the Society

CONTENTS

Umbilicaria pustulata var. papulosa and Lichen isla dicus	Frontispiece
Lichens of Mt. Katahdin, Maine	R. Heber Howe, Jr. 33
Brachymenium macrocarpum Card. in Florida and Funaria rubiginosa, Sp. Nov.	R. S. Williams 36
Florida Lichens	G. K. Merrill 39
Mosses of the Vicinity of St. John's University, Collegeville, Stearns County, Minn.	James Hansen 42
Slime Mould growing on a Moss	George B. Kaiser 45
Notes on Current Literature	Edward B. Chamberlain 46
Brinkman's Canadian Hepaticae	Caroline Coventry Haynes 47
Notice of Sullivan Moss Society Meeting	47
Editorial	48
Offerings Exchange Department	48

THE BRYOLOGIST

Bimonthly Journal of
THE SULLIVANT MOSS SOCIETY

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HEPATICS AND LICHENS

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1. *UMBILICARIA PUSTULATA* var. *PAPULOSA* Tuck. growing on fallen tree.



30. *islandicus*

2. *LICHEN ISLANDICUS* Linn. (Slightly reduced). No. 959, *Flora Suecica*;

No. 20 *Species Plantarum*

THE BRYOLOGIST

VOL. XVI

MAY 1913

No. 3

LICHENS OF MOUNT KATAHDIN, MAINE

R. HEBER HOWE, JR.

On July 18, 1911, I left Norcross, Maine, for the summit of Mt. Katahdin¹ (5,385 ft.). I crossed lakes Pemadumacook and Ambajejus to Tuck's camp on the steamer, and proceeded from there by canoe up the west branch of the Penobscot River to Sourdnahunk Falls, where I took the trail to Hunt's Camp on Kidney Pond, arriving there July 19. On July 21, I started for Katahdin, sleeping that night on its side, with the intention of spending the next day on the summit. After reaching the tableland, however, a terrific thunderstorm with cold rain and hail drove me to shelter beneath a boulder and I descended, after two hours of most disagreeable collecting, enveloped in dark clouds. I reached Hunt's Camp at dusk and returned to Norcross on July 24.

During this expedition I collected lichens all along the route and the specimens are now preserved in my herbarium. In the present list I am interpolating the species collected on Katahdin by the Rev. J. Blake and recorded in F. L. Harvey's Lichens of Maine.² I am grateful to Drs. Riddle, Hasse, and Scriba for valuable aid rendered in the determination of the *Stereocaulons*, crustose species, and *Cladonias* respectively.

SUB-ORDER: Cyclocarpineae

GROUP: Radiatae

FAMILY: Usneaceae.

1. *Usnea plicata* (L.) Web., Ambajejus Lake—sterile, on trees.
2. *Usnea florida* (L.) Web., Ambajejus Lake—fertile, on trees. Represents phase *U. subfusca* Strt.
3. *Usnea longissima* Ach., Ambajejus Lake—sterile, on trees. Represents phase *tenuis* Th. Fr.
4. *Usnea trichodea* Ach., West Branch—sterile, on dead trees.
5. *Letharia thamnodes* (Flot.) Hue, Katahdin (4,000 ft.), on trees—sterile; Ambajejus Lake, on trees—sterile; West Branch, on trees—sterile.
6. *Ramalina fastigiata* (Pers.) Ach. emend., Ambajejus Lake, on trees—fertile.
7. *Ramalina canaliculata* (Fr.) Herre, West Branch, on conifers—fertile. [*Cetraria islandica* (L.) Ach., Blake]

¹ Katahdin.

² Harvey, F. L. Contribution to the Lichens of Maine—I. Bull. Torr. Bot. Club 21: 389-393. 1894.

8. *Cetraria islandica* var. *crispa* Ach., Mt. Katahdin (5,000 ft.), on ground—sterile. I am reproducing here [Plate III, fig. 2] a photograph of the Linnaean type of *Lichen islandicus* which I made in London with the kind permission of Dr. B. Daydon Jackson. I have yet to see absolutely typical material from this country. Certainly the majority of records for the United States are referable to the variety *crispa* Ach.

9. *Cetraria islandica* var. *Delisaei* (Borr.) Schaer. = *C. hiascens* (Fr.) Th. Fr., Mt. Katahdin (5,000 ft.), on ground—sterile.

10. *Cetraria cucullata* (Bell.) Ach., Mt. Katahdin (5,000 ft.), on ground—sterile, also recorded by Blake.

11. *Cetraria nivalis* (L.) Ach., Mt. Katahdin (5,000 ft.), on ground—sterile, also recorded by Blake.

12. *Alectoria jubata* var. *implexa* Hoffm.) Ach., West Branch, on conifers—sterile.

13. *Alectoria chalybeiformis* (L.) S. F. Gray. Kidney pond, on trees—sterile.

GROUP: *Stratosi-Radiatae*

FAMILY: *Cladoniaceae*.

14. *Baeomyces ericetorum* (L.) Wain, Kidney pond, old log—fertile.

15. *Sterocaulon paschale* (L.) Fr., West Branch and Mt. Katahdin (5,000 ft.), on ground and rocks—fertile, also recorded by Blake.

16. *Cladonia rangiferina* (L.) Web., West Branch, on ground—sterile.

17. *Cladonia alpestris* (L.) Rabh., Mt. Katahdin (4,000 ft.) on ground—sterile, also recorded by Blake.

[*Cladonia cornucopioides* (L.) Fr., recorded by Blake.]

18. *Cladonia coccifera* var. *stematina* Ach., Mt. Katahdin (3,000 ft.), on ledge—fertile.

19. *Cladonia cristatella* Tuck., Ambajejus Lake, on stump—fertile. With fragments of *Cladonia cornuta* (L.) Schaer.

[*Cladonia amaurocraea* (Flk.) Schaer., recorded by Blake.]

20. *Cladonia furcata* (Huds.) Schrad., Ambajejus Lake—fertile.

[*Cladonia furcata* var. *subulata* Flk. recorded by Blake.]

[*Cladonia squamosa* Hoffm., recorded by Blake.]

21. *Cladonia squamosa* f. *denticollis* Wain., Ambajejus Lake, on ground—fertile.

22. *Cladonia turgida* (Ehrh.) Hoffm., West Branch, on ground—fertile.

23. *Cladonia gracilis* (L.) Willd., Mt. Katahdin (4,000 ft.), on ground—fertile.

[*Cladonia verticillata* Fr. recorded by Blake.]

24. *Cladonia pyxidata* f. *lepidophora* Flk., Ambajejus Lake, on rock—fertile.

GROUP: *Substratosae*

FAMILY: *Pseudophysciaceae*.

25. *Pseudophyscia speciosa* (Wulf.) Mull. Arg., Ambajejus Lake, on bark—sterile.

26. *Pseudophyscia aquila* (Ach.) Hue., Ambajejus Lake, on trees—fertile.

GROUP: *Stratosae*

FAMILY: *Physiaceae*

27. *Pyxine soledata* (Ach.) Fr., Kidney Pond, on bark and wood—sterile.

FAMILY: *Buelliaceae*

28. *Buellia parasema* (Ach.) Th. Fr., West Branch, on bark—fertile.

FAMILY: *Parmeliaceae*

29. *Parmeliopsis ambigua* (Ach.) Nyl., Ambajejus Lake, on wood—sterile.

30. *Parmeliopsis aleurites* (Ach.) Nyl., West Branch, on wood—sterile.

31. *Parmelia furfuracea* var. *Cladonia* (Tuck.) comb. nov., Mt. Katahdin (3,500 ft.), on spruce twigs—sterile (See Willey, Bull. Torr. Bot. Club 9: 152. 1882).

32. *Parmelia physodes* (L.) Ach., Kidney Pond, fertile—on bark.

33. *Parmelia pertusa* (Schränk.) Schaer., Ambajejus Lake, sterile—on bark.

34. *Parmelia conspersa* (Ehrh.) Ach., West Branch, fertile—on rock.

35. *Parmelia centrifuga* (L.) Ach., Mt. Katahdin (4,000 ft.), on ledges—fertile. Also recorded by Blake.

[*Parmelia olivacea* (L.) Ach., and variety *sorediata* Nyl. recorded by Blake.]

36. *Parmelia Borreri* var. *rudecta* Tuck., West Branch, fertile—on trees.

37. *Parmelia saxatilis* var. *sulcata* (Tayl.) Nyl., West Branch, on trees—sterile.

38. *Parmelia perlata* Ach., West Branch, on trees—sterile.

39. *Platysma oakesianum* (Tuck.) Nyl., Ambajejus Lake, on moss—sterile.

40. *Platysma glaucum* (L.) Nyl., Mt. Katahdin (3,000 ft.) and Kidney Pond, sterile—on trees.

41. *Platysma lacunosum* var. *atlanticum* (Tuck.) Nyl., West Branch, fertile—on twigs, also recorded by Blake under the synonym *Cetraria lacunosa* (L.) Ach.

42. *Platysma hepatizon* (Ach.) Wain. = *Platysma fahlunense* (Hoffm.) Nyl.—Mt. Katahdin (5,000 ft.) on rock—sterile. Also recorded by Blake.

43. *Nephromopsis ciliaris* (Ach.) Hue, West Branch and Kidney Pond, on birch—fertile.

FAMILY: *Lecanoraceae*

44. *Lecanora pallescens* (L.) Schaer., Ambajejus Lake, on bark—fertile.

45. *Lecanora rubina* (Vill.) Wain., Mt. Katahdin (4,000 ft.), on ledges—fertile.

46. *Lecanora subfusca* var. *argentata* Ach., Ambajejus Lake, on bark—fertile.

FAMILY: *Peltigeraceae*

47. *Peltigera polydactyla* (Neck.) Hoffm., Mt. Katahdin (3,000 ft.), on ground—fertile,—also recorded by Blake.

48. *Peltigera scutata* (Dicks.) Leight., Ambajejus Lake, on ground—fertile,

49. *Nephroma laevigatum* Ach., Ambajejus Lake, on wood—fertile.
50. *Nephroma helveticum* Ach., Ambajejus Lake, on tree—fertile.

FAMILY: *Stictaceae*

51. *Lobaria amplissima* (Scop.) Arn., West Branch, on trees—fertile.
52. *Lobaria pulmonaria* (L.) Hoffm., Ambajejus Lake, on trees—fertile.

FAMILY: *Gyrophoraceae*

53. *Gyrophora Dillenii* (Tuck.) Mull. Arg., West Branch, on rocks—sterile.
54. *Gyrophora Muhlenbergii* (Ach.) Schneid., West Branch, on rock—fertile.
55. *Gyrophora proboscidea* (L.) Ach., Mt. Katahdin (5,000 ft.), on ledges—fertile,—also recorded by Blake.

56. *Gyrophora hyperborea* (Hoffm.) Mudd, Mt. Katahdin (5,000 ft.), on ledges—fertile,—also recorded by Blake.

[*Gyrophora erosa* (Web.) Ach., recorded by Blake.]

57. *Umbilicaria pustulata* (L.) Hoffm., Mt. Katahdin (4,000 ft.), on ledges—fertile.

58. *Umbilicaria pustulata* var. *papulosa* Tuck., West Branch, on rocks—fertile; Kidney Pond, on log—sterile. [See Plate III, fig. 1.]

FAMILY: *Lecideaceae*

59. *Lecidea fusca* (Schaer.) Th. Fr., Ambajejus Lake, on moss—fertile.
60. (?) *Lecidea polycarpa* Fr., Mt. Katahdin (5,000 ft.), on rocks—fertile.
[*Lecidea contigua* Fr., recorded by Blake.]

[*Biatora sanguino-atra* (Fr.) Tuck., recorded by Blake.]

61. *Catillaria Laureri* Hepp, Ambajejus Lake, on bark—fertile.
62. *Rhizocarpon geographicum* (L.) DC., Mt. Katahdin (5,000 ft.), on rocks—fertile.

SUB-ORDER: *Coniocarpineae*

FAMILY: *Sphaerophoraceae*

[*Sphaerophorus fragilis* Pers., recorded by Blake.]

THOREAU MUSEUM OF NATURAL HISTORY, CONCORD, MASSACHUSETTS.

BRACHYMENIUM MACROCARPUM CARD. IN FLORIDA AND FUNA-
RIA RUBIGINOSA, Sp. Nov.

R. S. WILLIAMS

The genus *Brachymenium* of the *Bryeae* is mostly tropical or subtropical; several species are known from Mexico and quite a number are common in tropical South America. The single collection, so far as known, from this country seems to have been made by Chapman some fifty years ago at Quincy, in the north-western part of Florida, and has remained unnoticed under an incorrect name

ever since. The Florida specimens are without date of collection and the fruit is mostly not quite mature. I believe them to be the same species as that collected by C. A. Purpus at Zacuapan, Vera Cruz, Mexico, in 1907, and first referred to *B. Klotzschii*, but later named *B. macrocarpum* by Cardot, in *Revue Bryologique* 38: 6. 1911. The Mexican plant is said to differ from *B. Klotzschii* (Schwaegr.) Par. of Brazil, by having revolute leaf-borders and a red peristome, but I find that both the Florida and Mexican plants have the borders of the leaves often flat and the peristome rather pale. I have not seen specimens of the Brazilian species. The figures of it as given by Schwaegrichen are very similar to those of the northern specimens, so far as they go, but no inner peristomes shown and nothing is mentioned or figured of a revolute leaf-border.

(Note.—After the preceding remarks were in type Mrs. Britton kindly called my attention to the fact that *Leptotheca Wrightii* Sulliv. is a *Brachymenium*, and Dr. Grout has sent a specimen so called, collected at De Leon Springs, Florida, by G. C. Hood. This plant proves to be the same as the Chapman specimen and not *B. Wrightii* of Cuba, which apparently has not been collected in this country. *B. Wrightii* may be distinguished from *B. macrocarpum* by the leaves, which are two or three times larger, not so completely imbricate when dry, and by the much more differentiated leaf-border.)

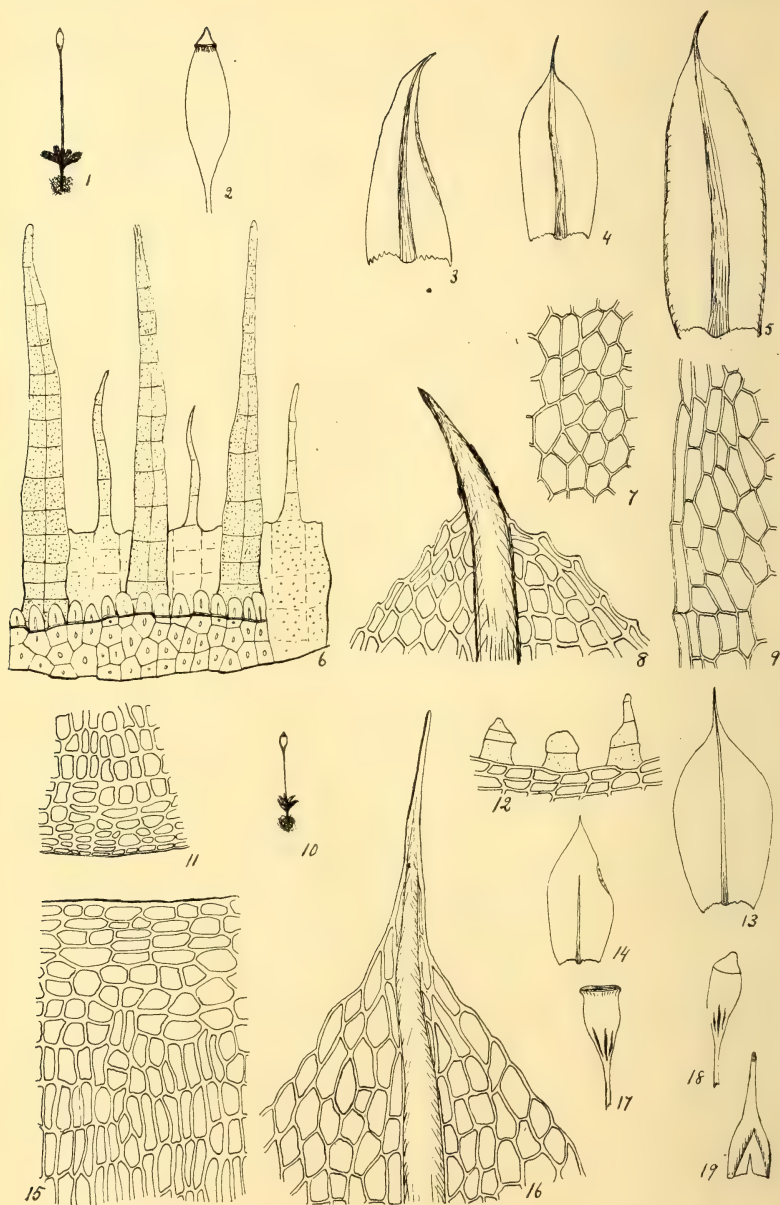
The accompanying figures (Plate IV, figs. 1-9) are from the Florida specimens.

Funaria rubiginosa Sp. Nov.

R. S. WILLIAMS

Male flowers not found. Fertile plants growing in compact cushions with mostly simple stems 3-5 mm. high; the upper stem and perichaetial leaves broadly ovate or slightly obovate, about 2 mm. long, with nearly or quite entire margins and acute, short-subulate point; costa often excurrent into the point in the upper leaves, vanishing well below the apex in the smaller, lower ones; leaf cells lax, the median more or less rhomboidal to hexagonal, about 20μ wide and up to 40μ long, the marginal scarcely different; seta erect, 5 or 6 mm. long; capsule erect about 2 mm. long, somewhat pyriform when dry, finally becoming reddish brown, with a furrowed neck scarcely as long as sporangium, containing about 3 rows of stomata; the cells about the rim of capsule transversely elongate in 4-6 rows, those farther down much elongate vertically, all with more or less thickened walls; peristome scarcely evident or sometimes of pale, slightly papillose, distant teeth of only 2 or 3 articulations each; annulus none; lid conic when moist, its height a little less than the basal diameter, the first 5 or 6 rows of lower cells transversely elongate, those above broadly oblong, in erect rows to the apex; spores rough, $25-28\mu$ in diameter; calyptra cucullate, long-beaked, more or less lacerate at base.

Type locality: Missouri River banks just below Great Falls, Montana, (June, 1887, No. 31, R. S. Willi ms.)



1- 9. *BRACHYMENIUM MACROCARPUM*
10-19. *FUNARIA RUBIGINOSA*

This species seems to be most closely related to *F. Bolanderi*, but that has a well-developed outer peristome, the leaf-cells rather larger and more lax and the costa vanishing far below the apex of leaf.

EXPLANATION OF PLATE IV

- | | |
|---|--|
| 1. <i>Brachymenium macrocarpum</i> , nat. size. | 10. <i>Funaria rubiginosa</i> , nat. size. |
| 2. Capsule x 6 diam. | 11. Part of lower lid x 100. |
| 3. Inner perichaetial leaf x 20. | 12. Peristome x 100. |
| 4. Branch-leaf x 40. | 13. Perichaetial leaf x 12. |
| 5. Outer perichaetial leaf x 20. | 14. Middle stem-leaf x 12. |
| 6. Peristome x 270. | 15. Part of upper capsule showing transverse cells at rim x 100. |
| 7. Median leaf-cells x 130. | 16. Apex of perichaetial leaf x 100. |
| 8. Apex of upper stem-leaf x 130. | 17. Capsule after opening x 5. |
| 9. Margin about half-way down leaf x 130. | 18. Capsule with lid x 5. |
| | 19. Calyptra x 5. |

NEW YORK BOTANICAL GARDEN.

FLORIDA LICHENS

G. K. MERRILL

The Lichens here listed, excepting two, are new to the flora of Florida, and six of them appear to be unreported from other sections of the United States. Most of the plants were collected by Mr. S. Rapp, of Sanford. Mr. Rapp is thoroughly well versed in the botany of his region, and to his keen-eyed searching, the new Lichen Flora of Florida will be overwhelmingly indebted.

STICTA (Ricasolia) DISSECTA Ach. Method. p. 279.

On various trees in company with *S. erosa*. Sanford, Fla. S. Rapp.

Plant small, but perfectly in agreement with the species. Exciple crenate or leafy-crenate and incurved. Thallus minutely scrobiculate.

S. DISSECTA forma *CORROSA* (Ach.) Merrill, *Lichenes Exsiccati* No. 42.

With the foregoing.

Margins and surface of the thallus here and there leafy-dissected. Thallus beneath very characteristic. Both the above new to Florida and probably to the United States.

PHYSCIA (Pseudophyscia) SPECIOSA var. **minor**, var. nov.

Thallus rather small (5-7 cm.) adnate, glaucous, glaucescent or fusco-glaucous, lacinate, the divisions rather radiant, linear, much divided, borders irregular or dentate, all the axils rounded, tips of the laciniae palmate and with crenate margins, more or less sorediate throughout on upturned margins of the laciniae; beneath as in the species, but with a greater development of rhizoids. Without apothecia in the specimens examined.

On various trees. Sanford, S. Rapp; Daytona and St. Augustine, G. K. Merrill; South Carolina, Dr. Green.

Type specimen preserved in herbarium Merrill.

A handsome little plant reposing in the herbaria of this Country under a variety of names.

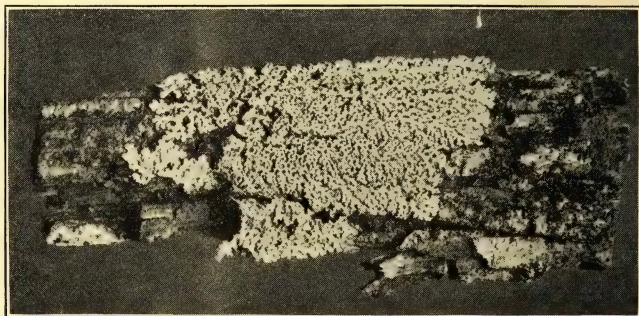


Fig. 1. *PHYSCIA SPECIOSA* var. *MINOR* Merrill.

Fig. 1—*PHYSCIA SPECIOSA* var. *MINOR* Merrill

LECANORA (*Rinodina*) *EXIGUA* (Ach.) Nyl. Flora., p. 197. 1873.

On *Viburnum*. Sanford, S. Rapp.

Apothecia very minute.

BIATORA (*Catillaria*) **endochroma** (Fee), comb. nov.

Apothecia primarily with a distinctly yellow proper exciple, which is at length excluded, disk black, the exciple blackening. Hymenium colorless, hypothecium thick and brown, paraphyses not well distinguished except at their knobbed tips, asci crowded and ventricose-clavate, epithecium black. Spores 8 in each ascus, 1-septate, fusiform-ellipsoid, colorless, $13-23 \times 5.5-7 \mu$ hymenial gel. with $1 +$ blue $>$ wine-red.

On *Magnolia glauca*, Sanford, S. Rapp.

Recorded from Florida in the Calkins-Eckfeldt list, but without data.

BIATORA (*Bacidia*) **UMBRINA** (Ach.) Tuck. Gen. p. 167.

Thallus little visible. Apothecia convex, black, margin soon excluded. Spores 8 in each ascus, fusiform-acicular, not curved, septa invisible, $24 \times 2 \mu$, Hymenium colorless or blackening upwards, asci ventricose-clavate, paraphyses distinct, lax, hypothecium colorless.

On fragment from an old tombstone, Sanford, S. Rapp.

New to Florida.

OPEGRAPHA PROSODEA forma **DIAPHORA** Tuck. Lich. Calif. p. 32.

Thallus limited by a dark line, smooth, greenish, fuscescent or olivaceous. Apothecia superficial, prominent, from ovoid much extended, linear, flexuous or stellate, terminations obtuse, about 1 mm. in width, 2-4 mm. in length, the disk

narrowed with conspicuous turgid incurved margins, black. Spores eight in each ascus, fusiform-acicular or "fusiform-oblong" 5-13-septate, the loculi squared, 40-45 x 5-6 μ , asci ventricose, paraphyses confused.

On water oak, Sanford, S. Rapp.

Seems to be new to the United States.

OPEGRAPHA HERPETICA Ach. Syn. p. 72.

Thallus dusky-olive or brownish, smooth or slightly uneven, sometimes cracked, limited with a fuscous line. Apothecia small, (0.5-1.0 mm.) innate or slightly emergent, variously shaped, but typically lirellate, straight or curved, simple or once divided, terminations obtuse, disk rimaeform commonly, but ultimately more open, margin thick, rounded, and inflexed, black. Spores eight in each ascus, fusiform, 3-septate, colorless, 15-24 x 3-4.5 μ , asci ventricose, paraphyses indistinct.

On bark of oak, Sanford, S. Rapp.

Previously unreported from Florida, and otherwise known to the writer from New York, only.

ARTHONIA PRUINOSULA Nyl. Prod. Nov. Gran. p. 573.

Thallus epiphlaeous, effuse, ashy or whitish-ashy, K—, C—. Apothecia rounded, angulate-rounded or oblong, small (about 0.5 mm.) scattered or sometimes connate, innate, sometimes circumcised, commonly a little convex, black, but suffused with an ashy or whitish pruina. Spores eight in each ascus, oblong, one end pointed, the other rounded and larger, colorless, 15-19 x 4.5-6 μ , asci saccate, hypothecium colorless, hymenial gel. with I+wine-red.

On petioles of Sabal palmetto, Sanford, S. Rapp; Daytona, Merrill.

This is the plant mentioned by Willey in the Synopsis Artho., p. 38, note.

ARTHONIA MACROTHECA Fee, Ess. Suppl. p. 42; Plate 40, f. 18.

Thallus epiphlaeous, effuse, whitish-ashy, K—, C—. Apothecia large (1-3 mm.), irregularly rounded, angular-rounded or sub-lobate, depressed, plane or slightly convex, scattered, aggregated or confluent, with or without a spurious thalline margin, black. Spores eight in each ascus, when young bilocular and constricted centrally, muriform and the stricture continuing when mature, brown or decolorate, 57-80 x 23-30 μ , asci saccate, hypothecium colorless, hymenial gel. with I+wine-red.

On *Magnolia glauca*, Sanford, S. Rapp.

This species is believed to be unrecorded for the United States, except Texas.

Pyrenula (*Arthopyrenia*) **analepta** (Ach.), comb. nov.

Thallus subcortical, coloring the bark a light or dark brown. Perithecia hemispherical, dimidiate, rather small. Spores eight in each ascus, colorless, 1-septate, constricted at the septa, one cell larger than the other, 18-24 x 6-8 μ , paraphyses lax or confused, asci clavate.

On *Ilex opaca*, Sanford, S. Rapp.

Not previously reported from Florida, at least under the present name.

ROCKLAND, MAINE.

MOSSES OF THE VICINITY OF ST. JOHN'S UNIVERSITY, COLLEGEVILLE, STEARNS COUNTY, MINNESOTA

REV. JAMES HANSEN

[Read at the Sullivant Moss Society Meeting, Minneapolis, Dec. 28, 1910]

The territory referred to in the title of this paper is contained within a radius of one mile from St. John's University. The greater part is hilly woodland, the more important trees being oaks, elms, maple, birch and poplars,—the underbrush consisting largely of hazel, sumach, blackberry, raspberry, hawthorns, prickly ash, dogwoods, leatherwood and several shrubs of the honeysuckle family. On the south is St. John's Lake, about one mile in greatest length, with a hilly shore and many little bays. There is also the millpond of the Watab, a creek which flows through the meadow land to the north of the buildings. There are many depressions or ponds in the woods which contain water for the greater part of the year. A tamarack swamp, the floor of which consists mostly of peat mosses, mixed with other mosses and liverworts, marks the eastern boundary of of the area.

The soil is for the most part sandy clay, covered with a thin layer of humus. There is no exposed rock, but occasionally granite boulders occur, while the elevation above sea level is between 1,100 and 1,200 feet.

Since 1908, when the writer joined the Sullivant Moss Society, he has been induced by Dr. Grout's book "Mosses with a Hand Lens" to take an occasional stroll into the environment briefly sketched above, for the purpose of learning something of its moss flora.

At first, attention was paid only to such specimens as were found in fruit and in sufficient quantity to yield a number of fairly generous mounts. But it became evident that the strict adherence to this rule would unnecessarily delay the acquisition of a knowledge of the mosses of the neighborhood, so it was modified to include also good sterile specimens, barring only evidently depauperate forms, when found in small quantities. If all species, good or poor, fruiting or sterile, had been collected, undoubtedly they would have doubled or trebled the list, but in almost all other respects the time and labor devoted to them would have been a distinct waste.

The 58 species collected and mounted for exhibition at the meeting are distributed among 31 genera, on the average, therefore, not even two species to one genus. The genus best represented is *Amblystegium*, with six species; next *Thuidium* with five, *Hypnum*, *Mnium*, and *Brachythecium*, with four each, and *Bryum* and *Dicranum* with three each.

All species of the list, except Nos. 6, 30, 55, and 57, are reported for Minnesota in one or more of the following reports of J. M. Holzinger: Minn. Bot. Studies **1**: 280, 579, and 590; **2**: 36; **3**: 109; and BRYOLOGIST **13**: 50. They may have been reported in lists of later date, but the writer has not seen them. All have been submitted for verification to Mr. N. L. T. Nelson, except those few which the writer thought he could safely classify, *e. g.*, the Catharineas, Poly-

trichums, and Mniums. Mr. Nelson's findings on Nos. 8, 15, 27, 28, 30, 38, 45, 46, and 55, at the time of the presentation of this paper, had not yet been received, so that they are somewhat doubtful.

In the writer's opinion, the list represents about one-half or one-third of the species which actually do occur in the territory concerned. Failure to find *Neckera*, *Webera*, *Pogonatum*, *Ptychomitrium*, *Philonotis*, *Fontinalis*, etc., is ascribed to scarcity or total absence of these forms. Rock-inhabiting forms, such as *Grimmia*, are missing because their substratum also is lacking in the vicinity, the only rock-loving form being *Hedwigia albicans* (Web.) Lindb., which is common on undisturbed granite boulders.

As far as the substratum of the mosses collected is concerned, the following points may be noted: The *Anomodon*s are quite common on living trees, near the base,—*A. rostratus* lower down than *A. minor* and seemingly preferring black ash. They are the only mosses found on living trees by the writer except *Amblystegium radicale* (Beauv.) Mitt.

Catharinea, *Polytrichum*, *Bryum*, *Ceratodon*, *Didymodon*, *Funaria*, *Ditrichum*, and *Leptobryum* are comparatively frequent on banks of roads. In the tamarack swamps, on the soil or about the base of trees, or on prostrate logs, *Sphagnum*, *Mnium*, *Dicranum*, *Hypnum*, *Thuidium*, *Amblystegium*, *Aulaacomnium*, and *Hylocomium* are to be found. *Bartramia*, *Fissidens*, and *Mniobryum* are found on the side or bottom of ditches in the meadow.

All the *Amblystegium*s, except *A. orthocladon*, which occurs on stones, are found on decaying wood in moist situations. The same is true of the *Hypnum*s, *Entodon*, *Platygyrium*, and all *Thuidium*s except *Th. Blarndowii* and *Th. delicatulum*, which are found on soil in the tamarack swamp. *Brachythecium acutum*, *B. rivulare*, and *B. salebrosum* were also collected in these swamps. *Climacium* is very common in meadows and near the borders of swamps and ponds, but does not fruit very freely.

Following is a list of the mosses collected by the writer in the vicinity of St. John's University, Collegeville, Stearns County, Minnesota, 1908-1910:

1. *Amblystegium varium* (Hedw.) Lindb. On decaying wood.
2. *Amblystegium serpens* (L.) Bryol. Eur. On decaying wood.
3. *Amblystegium riparium* (L.) Bryol. Eur. On decaying wood.
4. *Amblystegium Juratzkanum* Schimp. On decaying wood.
5. *Amblystegium orthocladon* (Beauv.) Kindb. On stone in bed of brook.
6. *Amblystegium radicale* (Beauv.) Mitt. Base of living tree.
7. *Anomodon minor* (Beauv.) Fuern.
8. *Anomodon rostratus* (Hedw.) Schimp.
9. *Aulaacomnium palustre* (L.) Schwaeg. Tamarack swamp, on soil.
10. *Bartramia Oederi* (Gunn.) Schwaeg. Side of ditch.
11. *Brachythecium acutum* (Mitt.) Sull. Among other mosses in swamp.
12. *Brachythecium acuminatum* (Hedw.) Kindb. Base of trees and stumps.
13. *Brachythecium rivulare* Bryol. Eur. Soil of tamarack swamp.

14. *Brachythecium salebrosum* (Hoffm.) Bryol. Eur. Soil of tamarack swamp.
15. *Bryum bimum* Schreb. Roadside.
16. *Bryum caespiticiun* L. Roadside.
17. *Bryum argenteum* L. Roadside.
18. *Catharinea angustata* Brid. Roadside.
19. *Catharinea undulata* (L.) W. and M. Roadside.
20. *Ceratodon purpureus* (L.) Brid. Roadside.
21. *Climacium americanum* Brid. On soil, at border of swamp.
22. *Climacium dendroides* (L.) W. & M. On soil, at border of swamp.
23. *Dicranum Bergeri* Bland. On soil at border of swamp.
24. *Dicranum flagellare* Hedw. On rotten wood, at border of swamp.
25. *Dicranum scoparium* (L.) Hedw. On rotten wood, at border of swamp.
26. *Didymodon rubellus* (Hoffm.) Bryol. Eur. Roadside.
27. *Ditrichum tortile* (Schrud.) Lindb.
28. *Drepanocladus aduncus* (Hedw.) Warnst. Bottom of dry ditch.
29. *Entodon cladorrhizans* (Hedw.) C. M. Rotten log.
30. *Fissidens adiantoides* (L.) Hedw. Side of ditch.
31. *Funaria hygrometrica* (L.) Sibth. Roadside.
32. *Georgia pellucida* (L.) Rabenh. On rotten stumps in tamarack swamp.
33. *Hedwigia albicans* (Web.) Lindb. On granite boulders.
34. *Hylacomium triquetrum* (L.) Bryol. Eur. On soil, border of swamp.
35. *Hypnum Haldanianum* Grev. On decaying log.
36. *Hypnum Crista-castrensis* L. On decaying log.
37. *Hypnum cordifolium* Hedw. In swamp on wet soil.
38. *Hypnum imponens* Hedw. On log.
39. *Leptobryum pyriforme* (L.) Wils. Roadside.
40. *Leucobryum glaucum* (L.) Schimp. On soil in swamp.
41. *Mnium cuspidatum* (L.) Leyss. (*M. sylvaticum* Lindb.) On soil in swamp.
42. *Mnium hornum*. L. On soil in swamp.
43. *Mnium affine* var. *ciliare* (Grev.) C. M. On soil in swamp.
44. *Mnium affine* var. *rugicum* (Laur.) Bryol. Eur. On soil in swamp.
45. *Mniobryum albicans* (Wahlenb.) Limpr. Bottom of dry ditch.
46. *Plagiothecium* sp. On soil in swamp.
47. *Polytrichum commune* L. Roadside.
48. *Polytrichum juniperinum* Willd. Roadside.
49. *Platygyrium repens* (Brid.) Bryol. Eur. On decaying log.
50. *Pylaisia Schimperii* Card. (*P. intricata* B. & S.) On bark of prostrate log.
51. *Rhodobryum roseum* (Weis) Limpr. On decaying log.
52. *Sphagnum acutifolium* Ehrh. In tamarack swamp.
53. *Sphagnum cymbifolium* Ehrh. In tamarack swamp.
54. *Thuidium microphyllum* (Sw.) Best. On log.
55. *Thuidium scitum* (Beauv.) Aust. On log.

56. *Thuidium minutulum* (Hedw.) Bryol. Eur. On log.
57. *Thuidium Blandowii* (W. & M.) Bryol. Eur. On soil of tamarack swamp.
58. *Thuidium delicatulum* (L.) Mitt. On soil of tamarack swamp.
ST. JOHN'S UNIVERSITY, COLLEGEVILLE, MINNESOTA.



Fig. 1.—*Leocarpus fragilis* (Dicks.) Rost. growing on the leaves of *Dicranum fulvum* Hook. Drawing by Mrs. Eva B. Gadsby.

SLIME MOULD GROWING ON A MOSS

GEORGE B. KAISER

In climbing Wittenburg (3,802 ft.) in the Southern Catskill Mountains of New York on the 11th of August, 1912, my attention was arrested by mats of *Dicranum fulvum* Hook. upon whose leaves were growing clusters of what appeared to be glossy brown ovoid capsules. Upon further investigation these clusters were found to be the fructifications of a Myxomycete, which was later determined by Frank J. Keeley as *Leocarpus fragilis* (Dicks.) Rost.—a synonym of *Leocarpus vernicosus* Link. This slime mould rather frequently occurs on dead leaves, but seems to grow rarely on mosses. I have never at any other time made a like collection.

NOTES ON CURRENT LITERATURE—I

EDWARD B. CHAMBERLAIN

Through the kindness of Mr. Harada of New York City, several short articles upon Japanese mosses have recently been translated for me. One of these¹ contains observations of such interest that, as it may not be readily accessible to American readers, an abstract is given herewith.

Prof. Okamura remarks that no species of Japanese moss had been known to show such a preference for saline situations as is exhibited by *Grimmia maritima*, the lack of knowledge being perhaps due to the limited amount of distributional studies possible. Recently, however, Mr. Nanpo sent to Prof. Okamura specimens "collected within reach of the spray on the seashore near Yuzaki, Province of Wakayama," which appear to show such a preference. This material, of which a detailed description but unfortunately no figures, is given, is considered by Prof. Okamura to represent a new species of *Dicranella*. The description, condensed, is as follows:

Dicranella salsuginosa S. Okamura. Stems 2 cm. high, erect, yellowish green, brown below; section about 0.14 mm. in diameter, with central strand. Leaves erect when dry, patent when moist, 1.7 x 0.2 mm., linear to lanceolate, acute; the upper longer and broader (4-5 x 0.6 mm.), often falcate-second and somewhat sheathing at the base. Cells linear to rectangular in the upper part, 14-50 x 14 μ in the lower leaves, 40-84 x 12-14 μ in the upper leaves, the marginal cells narrower (5 μ), basal cells about 28-40 x 2-3 μ . Perichaetial leaves similar, but sheathing at base. Seta erect, 8-9 mm., yellowish below, red above. Operculum long-rostrate, reddish, with a deciduous annulus of three rows of cells. Capsule erect, cylindric, not strumose nor constricted at the mouth, but a little arcuate with age, 1.36 x 0.4 mm., reddish brown, shining, 5-ribbed, and with a few stomata on the conical neck. Teeth linear, split to middle, about 280 μ long, yellow and papillose above, red and vertically striate below. Male inflorescence not seen.

After studying the moss, Prof. Okamura made a series of tests to determine the extent to which the moss showed the influence of salt water. Owing to the small amount of material used, it is not possible to draw any general conclusions from the results; yet, since similar tests have not to my knowledge been made upon other mosses, it seems worth while to call attention to Prof. Okamura's work in detail, with the hope that others may be able to supplement his results.

The moss plants were first examined carefully to see if any external deposit of salt could be detected. This gave wholly negative results to microscopic examination or to the taste, but when a portion of the plant was soaked in 500 times its volume of distilled water and silver nitrate added drop by drop, a white precipitate was clearly perceived. A less quantity of water gave a more decided result. This seemed to indicate a small amount of salt on or near the surface of the plants; an amount that varied according to the part of the plant treated.

¹ Shutai Okamura: On the Japanese Saline Moss. Tokyo Botanical Magazine, 1911, pp. 113-119.

A small portion of a plant was then carefully washed in distilled water, until no precipitate appeared with silver nitrate, after which the material was thoroughly dried. The dry portion was pulverized in a perfectly clean mortar and the powder extracted with about 20 times its volume of distilled water, the mixture during the extraction being boiled until about one-half the quantity of liquid remained. This liquid, when filtered, was clear, but gave with silver nitrate an abundant white precipitate, which was much more copious than that obtained in the first experiments. This was taken by Prof. Okamura to indicate the absorption of sea salt by the tissues of the moss plant.

A quantitative test, which could not be repeated owing to lack of material, was also made. A portion of the plant, weighing 150 mg. when washed and dried as before, was pulverized and extracted with boiling distilled water. The silver chloride resulting, when filtered out and dried, weighed 105 mg., from which Prof. Okamura calculates that about 28% of salt was present in the washed and dried portion of the moss.

This last result seems rather high in view of the fact that Prof. Okamura could detect no salty taste in the plant itself. But, as is suggested in the article, interesting comparisons are possible with material of *Grimmia maritima* to see whether it also shows similar evidence of any absorption of salt.

NEW YORK CITY.

BRINKMAN'S CANADIAN HEPATICAE

CAROLINE COVENTRY HAYNES

It is with much pleasure that I call attention to the sets of Canadian *Hepaticae* offered for sale by Mr. A. H. Brinkman. He is in a land of great plenty, so far as they are concerned, and has collected many of the rarer ones. This set, numbering 1-20, contains the following rare Lophozias: *badensis*, *Hatcheri*, *heterocolpa*, *Rutheana*, together with *Sphenolobus politus* and *scitulus*. If the sets are subscribed for, it is his intention to issue additional species. It is to be hoped that Curators of Museums and private collectors will quickly avail themselves of the opportunity to obtain such valuable material.

HIGHLANDS, NEW JERSEY.

NOTICE OF SULLIVANT MOSS SOCIETY MEETING

The Sullivant Moss Society will hold an all-day meeting on Saturday, May 24th, as guests of the Brooklyn Botanic Garden and the Museum of the Brooklyn Institute of Arts and Sciences, at Eastern Parkway, near Flatbush Avenue, Brooklyn. There will be presented an informal program, the time of day and the length depending on circumstances. If the weather is fine one part of the day will be devoted to a walk in the grounds and through the greenhouses, under the guidance of Dr. Gager and Mr. Norman Taylor.

The treasures of the Herbarium will be shown by Mr. E. L. Morris, and if the day prove stormy there will be ample entertainment offered by the custodians of the various exhibits. Luncheon may be had at a nearby restaurant at moderate prices.

All members of the Society and their friends will be made welcome. Meet as early in the day as convenient at the Museum Building. Those unable to be with us are asked to contribute something in the way of greeting or short note on any botanical subject of interest. Send manuscripts, letters, and inquiries to Mrs. Annie Morrill Smith, 78 Orange Street, Brooklyn, N. Y.

April 16, 1913.

EDITORIAL

Before consenting to relieve our good friend, Dr. Grout, of the burdens of editorship of THE BRYOLOGIST, the present writer paused for long and serious thought, knowing full well the none too sufficient time at his disposal for such work. However, friends and co-workers everywhere have promised to help, and some have already been of great assistance, and your Editor feels that the work, as well as our mutual relations, will be none other than most pleasant. We hope to be able to keep THE BRYOLOGIST up to its present standard of excellence, and friendly criticisms and advice will always be most welcome, particularly from those to whom is due the excellent and steady development of our magazine.

EXCHANGE DEPARTMENT

Offerings—To Members Only, For Stamped Self-Addressed Envelope

Dr. R. Heber Howe, Thoreau Museum of Natural History, Concord, Mass.—*Dactylina arctica* (Hook.) Nyl. Collected in Newfoundland.

Mrs. Annie Morrill Smith, 78 Orange St., Brooklyn, N. Y.—*Eurhynchium stoloniferum* (Hook.) Cardot, collected near New Westminster, British Columbia, and *Theloschistes parietinus* (L.) Norm., collected on Cape Cod, Mass.

Dr. H. S. Jewett, 15 West Monument Avenue, Dayton, Ohio.—*Plagiothecium geophilum* (Aust.) Grout. Collected in Ohio.

Dr. H. E. Hasse, Box 583, Santa Monica, California.—*Alectoria oregana* Nyl.; *Arthothelium orbiliferum* (Almq.); *Arthothelium pruinoscens* A. Zahlbr.; and *Anaptychia erinacea* (Ach.) Herre. All collected in California.

Mr. D. Lewis Dutton, Brandon, Vermont.—*Timmia cucullata* Michx.; *Catharinaea angustata* Brid., both *c. fr.* Collected in Vermont.

Mr. Edward B. Chamberlain, 18 West 89th St., New York City.—*Hypopterygium struthiopteris* Brid., *c. fr.* Collected in New Zealand.

NOTICE.—The Sullivant Moss Society owns a compound microscope,
the gift of Mrs. M. L. Stevens. Applications for the
loan of the same to members of the Society should be made to

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CONTENTS

Notes on North American Hepaticae . . .	Alexander W. Evans	49
First Supplement, Sullivant Moss Society Exchange List of Hepaticae of United States and Canada	Carolyn Coventry Haynes	55
New and Interesting Lichens from the State of Washington	G. K. Merrill	56
Notes on the North American Sphagnum V. (To be Concluded)	A. LeRoy Andrews	59
Ninth Public Meeting of the Sullivant Moss Society	Annie Morrill Smith	62
Editorial		64
Exchange Department		64

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THE BRYOLOGIST

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NOTES ON NORTH AMERICAN HEPATICAE. IV

ALEXANDER W. EVANS

With the exception of the new species of *Cololejeunea* from Florida the Hepaticae discussed in the present paper are all more or less well known. The first species is introduced to call attention to a question of synonymy, the others to record extensions of geographical distribution. It is perhaps worthy of note that twenty-nine species of Lejeuneae, including the two additions mentioned below, are now known from Florida. Since the writer published his synopsis of the Lejeuneae of the United States and Canada,¹ eleven years ago, thirteen species of this group have been added to the flora of the state, and still further additions may reasonably be expected.

I. *RICCIA ARVENSIS* Aust.

The writer recently brought out the fact that *Riccia bifurca*, as understood by recent European authors, was very closely related to the North American *R. arvensis*.² It was intimated, indeed, that the two species were probably identical, although no definite conclusion was reached in the absence of living material of *R. bifurca* for comparison. Such material has since become available. It was collected by W. E. Nicholson near Hastings, Sussex, England, and sent to Miss Lorenz at Hartford. A portion of this material was kindly forwarded to New Haven and compared with typical specimens of *R. arvensis*. It proved beyond a doubt that the two species were synonyms. On the basis of this identity the writer again suggests that the species should bear the name *R. arvensis* Aust., in spite of the fact that *R. bifurca* Hoffm. was published in 1795 while Austin's name dates from 1869. The reasons for this suggestion have already been stated at length. They are based upon the following facts: first, that no one knows positively which species or group of species formed the basis for Hoffmann's description; second, that *R. bifurca*, as at present understood, dates from 1898, when Heeg definitely restricted the application of the name; third, that, in our ignorance of Hoffmann's type, there is no convincing evidence that *R. bifurca* Heeg is identical with, or included under, *R. bifurca* Hoffm.; and fourth, that Austin's *R. arvensis* was clearly described and definitely understood long before the publication of Heeg's paper. If this suggestion is adopted the name *R. bifurca* will disappear from the literature as the accepted name of a recognized species.

¹ Mem. Torrey Club 8: 113-183. pl. 16-22. 1902.

² Rhodora 14: 3. 1912.

2. *RICCIELLA HUEBENERIANA* (Lindenb.) Dumort. Hep. Europ. 171. 1874. *Riccia Huebeneriana* Lindenb. Nova Acta Acad. Caes. Leop. Carol. 18: 504 d. pl. 37, f. 3. 1836. *Riccia Klinggraeffii* Gottsche, Bot. Zeit. 17: 89. 1859. *Riccia fluitans* β *purpurascens* Klinggr. Leber- und Laubm. West- und Ostpreussens 40. 1893.

Collected in November, 1912, at Highlands, Monmouth County, New Jersey, on the clay bottom of a drained pond, by Miss Haynes, Miss Lorenz, and the writer. Specimens from this locality have recently been distributed by Miss Haynes in her American Hepaticae, No. 116. *R. Huebeneriana* was first recorded as a North American species by Underwood, in 1894,¹ who cited it from Massachusetts, New Jersey, and Ohio. The next year, however, he made it clear that he understood the species in a somewhat broader sense than is now done, including under it *R. Sullivantii* (Aust.) Evans as a synonym.² Since most if not all of the specimens which he quoted would now be referred to *R. Sullivantii*, nothing definite is known about the distribution of *R. Huebeneriana* in North America. The station noted above is therefore worthy of record. The species grows in localities which are favorable for *Riccia arvensis* and *Ricciella Sullivantii*. It is characterized by its small size, by its reddish or purplish pigmentation, and by its incomplete rosettes, the thallus forking two or three times with spreading branches. The species is fully described by Müller in Rabenhorst's Kryptogamen-Flora 6: 206. 1907.

3. *Riccardia palmata* (Hedw.) Carruth. *Aneura palmata* Dumort.

Collected in January, 1913, at Sanford, Florida, on a cypress log in a swamp, by S. Rapp. The earlier writers on North American Hepaticae ascribed a wide distribution to the present species. In 1874, however, Lindberg³ pointed out the fact that two distinct species were included under *Aneura palmata*, as ordinarily understood. He reserved the specific name *palmata* for one of these species and described the other as *Aneura latifrons*, sp. nov., afterwards changing the name to *Riccardia latifrons*.⁴ To this species he referred the specimens distributed by Sullivant in his Musc. Alleg., No. 279, under the name *Aneura palmata*. Several years later Underwood stated, or at least implied, that all the North American material of *A. palmata* really belonged to *A. latifrons* and that the true *A. palmata* was not known from this side of the Atlantic.⁵ But the next year he listed *A. palmata* from British Columbia,⁶ and since that time an extensive distribution of the species in North America has gradually been re-established. At the present date it is known with more or less certainty from Alaska, British Columbia, Washington, Oregon, and California, and also from Nova Scotia, Ontario, Maine, New Hampshire, Vermont, Connecticut, New York, West Virginia, and Wisconsin. Its detection in Florida indicates of course a

¹ Bot. Gaz. 19: 277. 1894.

² Syst. Bot. North Amer. 9^a: 4. 1895.

³ Not. pro F. et Fl. Fenn. 13: 372-376. 1874.

⁴ Acta. Soc. Sci. Fenn. 10: 513. 1875.

⁵ Bot. Gaz. 14: 197. 1889. Gray's Manual, Ed. VI. 725. 1890.

⁶ Zoe 1: 365. 1891.

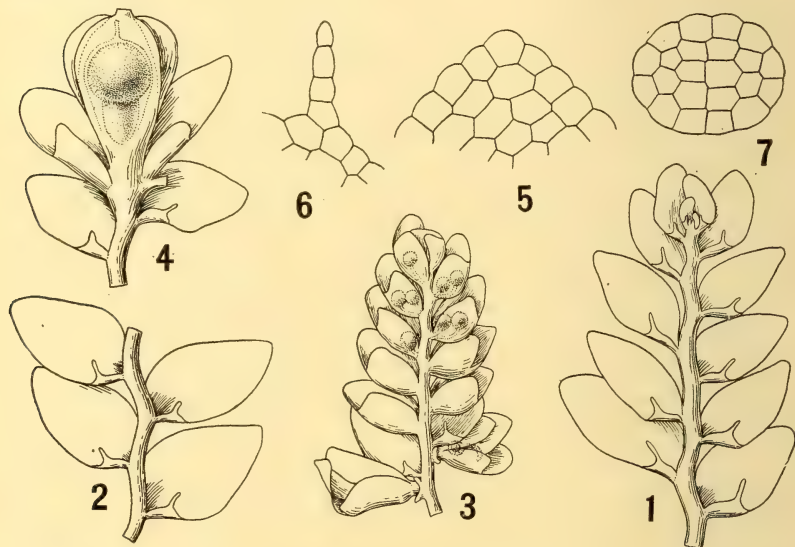
marked extension of its known range to the southward. The specimens bear both gemmae and mature capsules and are in unusually good condition. Outside of North America *Riccardia palmata* is widely distributed in Europe and northern Asia.

4. *Cololejeunea setiloba* sp. nov.

Collected at Sanford, Florida, by S. Rapp. The material consists of three specimens, namely: No. 12, on trunk of myrtle near the base, January 28, 1906; No. 27, on trunk of *Ilex glabra*, May 10, 1912; No. 59, May 16, 1912. No. 27 may be designated the type. The specimens are all preserved in the herbarium of the writer at New Haven, Connecticut

Yellowish or dark green, growing in depressed mats; stems about 0.05 mm. in diameter, appressed to the substratum, at first simple, but afterwards becoming irregularly and often copiously branched, the branches widely spreading, rarely elongated and similar to the stem, usually very short and bearing sexual organs; rhizoids mostly sparingly produced; leaves distant to subimbricated, the lobe obliquely to widely spreading, plane or slightly convex, ovate from a narrow base, gradually narrowed toward the obtuse or rounded apex, maximum size about 0.4×0.3 mm., but often considerably smaller, margin crenulate from projecting cells; lobule in the form of a narrow basal fold with a straight or slightly arched keel, the free margin bearing a single tooth usually consisting of from two to four cells in a row, occasionally two cells wide at the base, hyaline papilla at the tip of the tooth; stylus reduced to a hyaline papilla at the base of the lobule; leaf cells averaging about 15μ along the margin and 18μ in the median and basal portions of the lobe, convex, thin-walled throughout: inflorescence autoicous: ♀ inflorescence sometimes borne on an elongated branch, sometimes on a more or less abbreviated branch, innovating on one side, the innovation usually short and sterile, but sometimes floriferous; bracts obliquely spreading, distinctly complicate but not winged along the keel, the lobe much as in the leaves but usually smaller than the lobes on robust primary shoots, averaging about 0.35×0.15 mm., margin crenulate, lobule oblong or obovate, the free portion variable in extent, rounded to subacute, averaging about 0.2×0.09 mm.; perianth obovoid, about 0.45 mm. long and 0.35 mm. in diameter, sharply five-keeled to about the middle, the keels roughened from projecting cells, rarely narrowly winged, apex rounded to truncate with a short beak, basal stipe (formed after fertilization) usually short: ♂ inflorescence sometimes terminal on a leading branch, sometimes on a very short branch, the bracts mostly in from one to six pairs, complicate-bilobed with subequal lobes or with the dorsal lobe slightly larger than the ventral, both lobes rounded to subacute at the apex; antheridia mostly in pairs: gemmae without organs of attachment, broadly orbicular, averaging about 0.075×0.09 mm., margin crenulate from projecting cells: capsule about 0.15 mm. in diameter; spores greenish, minutely verruculose, about 15μ in short diameter; elaters about 5μ wide. (FIGURES 1-7.)

The present species is the fourth member of the genus *Cololejeunea* (in its restricted sense)¹ to be reported from the United States, the others being *C. Biddieconiae* (Aust.) Evans, *C. diaphana* Evans, and *C. minutissima* (Smith) Schiffn. A fifth species, *C. Jooriana* (Aust.) Evans, has recently been transferred to the genus *Leptocolea* by the writer and is now known as *L. Jooriana* (Aust.) Evans.



COLOLEJEUNEA SETILOBA Evans

FIGS. 1 and 2. Robust sterile stems, ventral view, $\times 45$.

FIG. 3. Antheridial spike with two female inflorescences on short branches, ventral view, $\times 45$.

FIG. 4. Tip of a robust female branch with perianth and sporophyte, ventral view, $\times 45$.

FIG. 5. Apex of a robust lobe, $\times 250$.

FIG. 6. Tooth of a lobule, the terminal cell being a hyaline papilla, $\times 250$.

FIG. 7. Gemma, $\times 250$.

The figures were all drawn from the type specimen.

The most remarkable feature of *C. setiloba* is the lobule, which differs considerably in structure from the lobule found in the other species of the genus (Fig. 6). Instead of being large and inflated it is small and plane. Instead of bearing two (or more) marginal teeth it bears a single tooth. This tooth, however, which is homologous with the apical teeth of the other species, is well developed and usually consists of a row of three or four cells, instead of being

¹ See Evans, Bull. Torrey Club **38**: 251-286. pl. II, 12. 1911. Reference should be made to this paper in reading the various critical notes under *C. setiloba*.

composed of only one or two cells. The hyaline papilla, finally, is situated at the tip of this tooth instead of near the base. Although lobules of the kind just described seem to be new to the present genus, somewhat similar lobules are known in certain species of *Leptocolea* and *Lejeunea* and represent equally marked deviations from the type of lobule characteristic of these genera. In the African *Leptocolea cuneifolia* (Steph.) Evans, for example, the apical tooth consists of a long row of cells tipped with a hyaline papilla, but this tooth is associated with a lobule which is inflated and otherwise normal in structure. In *Lejeunea pililoba* Spruce, of Florida and the West Indies, the lobule agrees still more closely with that of the new *Cololejeunea*. It consists of a small basal fold bearing a very long filiform tooth with a hyaline papilla at its tip. Broader apical teeth with terminal papillae are known in *Leptocolea planifolia* Evans, of Porto Rico, and in its immediate allies, as well as in *Lejeunea spiniloba* Lindenb. & Gottsche, of tropical North America, a species to which the writer has recently called attention.¹ In the species of *Leptocolea* with these broad apical teeth, the lobules not only diverge widely from the condition normal to the genus, but are inconstant in their characters. In describing their peculiarities the suggestion was made that they might simply represent an abnormal development and that normally developed lobules might conform more closely to the type characteristic of the genus. The study of *Cololejeunea setiloba* leads to a similar hypothesis. The lobules present every appearance of being poorly or abnormally developed, and it is quite possible that the discovery of normally developed lobules might necessitate a revision of some of the characters assigned to the species. The great frequency of poorly developed lobules in other members of the genus, such as *C. minutissima* and *C. myriocarpa* (Nees & Mont.) Evans, lends further support to this idea, and the same thing may be said of the large and broad lobules found on the perichaetial and perigonal bracts. At the same time a careful examination of Mr. Rapp's material has failed to demonstrate any lobules unlike those described.

Leaving the lobules out of consideration *C. setiloba* shows much in common with *C. minutissima*, a widely distributed species in Europe, Bermuda, and the southern United States. The two species agree in inflorescence, in the structure of the perianth, and in the thin-walled cells. In *C. setiloba*, however, the lobes of the leaves are larger, relatively narrower, and usually more distinctly tapering toward the apex. In *C. Biddlecomiae*, the commonest species in the United States, the inflated lobules, the papillate lobes and perianths, and the long stylus afford striking distinctive characters. In *C. diaphana*, known only from Florida and Porto Rico, inflated lobules are occasionally produced, but in the absence of these structures the narrower and more pointed lobes, the more or less elongated leaf cells, and the solitary antheridia will serve to distinguish the species.

Gemmae are abundantly produced by *C. setiloba* and show, both in development and in structure, the features characteristic of the genus. Unfortunately they are not always well developed, but a typical gemma is shown in Fig. 7. It

¹ BRYOLOGIST 15: 61. 1912.

will be noted that each apical quadrant has cut off three segments and that, by subsequent divisions in these segments and in the basal quadrants, the mature gemma shows eleven cells on each side or twenty-two cells in all. The gemma is crenulate along the margin and lacks organs of attachment. In *C. Biddlecomiae* and *C. minutissima* the apical quadrants cut off three and four segments respectively, while in *C. diaphana*, either three or four segments are cut off. The gemmae in the first two of these species agree with those of *C. setiloba* in their crenulate margins and lack of organs of attachment; in *C. diaphana* three such organs are produced, and the margin is denticulate rather than crenulate.

5. RECTOLEJEUNEA BRITTONIAE Evans, Bull. Torrey Club **38**: 209. *pl. 9, f. 1-12*. 1911.

Collected in March, 1913, at Sanford, Florida, on oak, by S. Rapp (No. 63), growing in company with *Mastigolejeunea auriculata* (Wils. & Hook.) Schiffn.: also in March, 1910, at Sigüanea, Trinidad Mountains, Santa Clara, Cuba, on a tree trunk, by E. G. Britton (No. 4933); also, in 1913, at Azua, Santo Domingo, by J. N. Rose. At the time this species was described it was known with certainty from the Bahama Islands only. Since, however, it is widely distributed and abundant on these islands, its detection in material from Florida and the West Indies is not at all surprising.

6. PRIONOLEJEUNEA SERRULATA (Mont.) Steph. Sp. Hepat. **5**: 224. 1913. *Lejeunea serrulata* Mont.; Ramon de la Sagra, Hist. phys. pol. y natur. de Cuba **9**: 479. *pl. 18, f. 3*. 1845.

Collected in August, 1905, on a rock in a stream, near Marmelade, Hayti, by G. V. Nash and N. Taylor (No. 1343). Originally collected by Auber in Cuba, no more definite locality being indicated by Montagne. No other stations for the species are known at the present time.

7. LEPTOLEJEUNEA HAMULATA (Gottsche) Schiffn. See Evans, Bull. Torrey Club **29**: 504. *pl. 24*. 1902.

The species was originally described from Cuban specimens collected by C. Wright and distributed in his Hepaticae Cubenses. Many years later the writer discovered it near Cayey, Porto Rico, and published a new description of it with figures. It has been found also in the vicinity of Mayaguez, Porto Rico, first by A. A. Heller, in 1900, and afterwards by E. G. Britton and D. W. Marble, in 1906, (No. 738). Specimens from Heller's collection have been distributed by Miss Haynes in her American Hepaticae (No. 85). During the present year the species has been gathered by Mann at St. Marc, Hayti, and by R. Thaxter at Grand Etang, Grenada, so that it is now known from four of the West Indian Islands. It apparently flourishes at rather low altitudes.

8. CYCLOLEJEUNEA CHITONIA (Tayl.) Evans, Bull. Torrey Club **31**: 194. *pl. 8, f. 16-23*. 1904.

Collected in March, 1909, at Cuna-Cuna Gap, Jamaica, by E. G. Britton (No. 1291); also, in 1913, at Grand Etang, Grenada, by R. Thaxter. Extensions of range. Formerly known from British Guiana (the type locality), Porto Rico, Guadeloupe, Martinique, and St. Vincent.

9. *FRULLANIA COBRENSIS* Gottsche; C. Wright, Hep. Cubenses (*nomen nudum*). Stephani, Hedwigia **33**: 142. 1894.

Collected in April, 1912, at Sanford, Florida, on maple and cypress, by S. Rapp (No. 57). Originally collected by C. Wright, in Cuba, and distributed in his Hepaticae Cubenses. Although no definite locality is mentioned the plant probably came from the vicinity of El Cobre, a town near Santiago, at the eastern end of the island. Until its rediscovery in Florida no other stations for the species had been recorded. In connection with *F. Rappii*, a species likewise from Sanford, Florida, which was proposed as new by the writer in the BRYOLOGIST for March, 1912, attention was called to *F. cobrensis* and to its close relationship to the new species. Its prompt discovery by Mr. Rapp was very noteworthy. In spite of their close affinities and of the fact that they grow in the same region, the two species seem to retain their distinctive characters.

10. *ANTHOCEROS PUNCTATUS* L.

Collected in February, 1902, along Basset Cave Road, Bermuda, by H. Kennedy, and in March, 1902, at Walsingham Caves, Bermuda, by the same collector. New to Bermuda and the second member of the Anthocerotales to be reported from the island, the first being *A. levis* L.¹ In the plants collected in March the spores are fully mature; in those collected in February they are still immature, but sufficiently advanced to show their distinctive features. The specimens were kindly communicated to the writer by Professor W. G. Farlow.

YALE UNIVERSITY.

FIRST SUPPLEMENT—SULLIVANT MOSS SOCIETY

EXCHANGE LIST OF HEPATICAE FOUND IN UNITED STATES
AND CANADA

COMPILED BY MISS CAROLINE COVENTRY HAYNES FROM VARIOUS SOURCES

[Read at S. M. S. Meeting, Brooklyn Botanic Garden, May 24, 1913.]

ADDITIONAL SPECIES

METZGERIACEAE

Pallavicinia hibernica (Hook.) S. F. Gray

JUNGERMANNIACEAE

Sphenolobus politus (Nees) Steph.

Chiloscyphus rivularis (Schrad.) Loeske

This is raised from varietal to specific rank.

¹ See Evans, BRYOLOGIST **13**: 36. 1910.

Cephaloziella elegans (Heeg) K. Müller not Schiffn.
Odontoschisma elongatum (Lindb.) Evans
Cololejeunea setiloba Evans
Rectolejeunea Brittoniae Evans
Frullania cobrensis Gottsche
Frullania Rappii Evans

CHANGES IN NOMENCLATURE

JUNGERMANNIACEAE

Marsupella robusta (DeNot.) Evans is now *M. aquatica* (Lindenb.) Schiffn.
Lophozia Baueriana Schiffn. is now *L. Hatcheri* (Evans) Steph.
Lophozia Lyoni (Tayl.) Steph. is now *L. quinquedentata* (Huds.) Cogn.
Cephalozia lunulaefolia Dumort. is now *C. media* Lindb.
Cephaloziella Starkii (Nees) Schiffn. is now *C. byssacea* (Roth) Warnst.
Cheilolejeunea pililoba (Spruce) Evans is now *Lejeunea pililoba* Spruce

[Address Mrs. Annie Morrill Smith, 78 Orange Street, Brooklyn, N. Y., for copies of this Supplement—Cost, one cent each.]

NEW AND INTERESTING LICHENS FROM THE STATE OF
WASHINGTON

G. K. MERRILL

[Presented in brief by Dr. Alexander W. Evans at S. M. S. Meeting, Brooklyn Botanic Garden, May 24, 1913.]

The Lichens noticed in this paper were collected by Mr. A. S. Foster, who has been an assiduous collector of Lichens and Mosses for a number of years, and who possesses an unsurpassed field knowledge of these humble plants for the regions of his investigations. Only a few of the noteworthy and novel forms discovered by him are comprehended in the present treatment.

COLLEMA MELAENUM Ach. Lich. Univ., p. 636.

On rocks, alt. 3,500 ft., Republic, Wash., No. 2361.

Plants without apothecia, but determination certain.

I know of no other record for the United States.

CLADONIA DEFORMIS forma GONECHA (Ach.) Nyl. Syn. I., p. 222.

On humus over rocks, Republic, Wash., No. 2362.

Characterized by more or less turgid, scarcely fissured podetia, the scyphi lacerated. The cortex of the species is cartilaginous below and pulverulent above, in the form almost wholly pulverulent. The colors range from creamy ochroleucous to light blue-green. Very seldom found with apothecia in American specimens. Elsewhere found in the Klondike region, Lake O'Hara, B. C., and Pipestone Valley, Atha., all collected by Prof. J. Macoun. Wainio includes the form in his modification *extensa* (Hoffm.) Wain., but the plant clearly deserves separate recognition.

UMBILICARIA (*Gyrophora*) PROBOSCIDEA forma EXASPERATA Ach. Method., p. 105.

Thallus plicate-rugose, the plicæ erect, 1–2 mm. in height, more or less reticulately disposed, the crests roughened. Apothecia and spores of the species.

On rocks, alt. 4,000 ft., Republic, Wash., No. 2362.

Thallus similar in color to that of the species, or gray-pruinose, or at times black. In our specimens the individual plants are small and the rugæ extend to the margins. I know of no previous American record for the form.

LECANORA (*Callopisma*) NIVALIS var. **minor** var. nov.

Thallus as in the species. Apothecia small (about 1 mm.) congregated, plane or slightly convex, disk orange or rusty-orange, without thalline border, but the proper margin distinct and lighter in color than the disk. Spores linear-oblong or narrow-ellipsoid, simple or with a thin central septum, $20 \times 6-9 \mu$.

On mosses over rocks, Republic, Wash.

Differing from the species in color of the apothecia, shape and dimensions of the spores.

Type specimen in herb. Merrill.

LECANORA (*Squamaria*) RUBINA forma **discreta**, f. nov.

Thallus of widely scattered, monophyllous, peltate, olive-green, black-margined squamæ. Apothecia small, crowded, completely concealing the thallus, disk plane or concave, olive-green, glaucous-pruinose, with an entire, more or less flexuous, slightly elevated margin. Spores ovoid or ellipsoid, simple, $11 \times 6-7 \mu$, epithecium dark, asci sub-saccate.

On rocks, Republic, Wash.

Sharing characters with var. *peltata* Torsell, and *nigromarginata* of the species, the plant also presents similarities to *L. melanophthalma* (Ram.) Nyl. and its forma *glauca* (Ach.) Nyl.

Type specimen in herb. Merrill.

LECANORA ATRYNEA (Ach.) Nyl. Flora, 1872, p. 250, note 2.

On rocks touched by the waves of Hoods Canal, Hoodsport, Wash., No. 2131.

The habitat given for this specimen is exactly that of *L. subfusca campestris* as it occurs in Maine. Mr. Foster's specimen is without the white byssine hypothallus of the Knox County plant, and seems best placed as above. The species is almost unknown in this country.

LECANORA (*Dimelaena*) THYSANOTA (Tuck.) Hasse Lich. So. Calif., 1898, p. 11.

On granite, Republic, Wash., No. 2319a.

Spores eight in each ascus, short-ellipsoid, sometimes slightly constricted at the septum, brown $10-12 \times 8-9 \mu$, hymenium and hypothecium hyaline, paraphyses indistinct, epithecium brownish, asci ventricose.

Very little is known of this plant, and growing as it does among other dark colored lichens on exposed rocks, it is easily overlooked.

Reported from California and Oregon in Tuckerman's Synopsis, and Dr. Hasse has found it in his region.

LECANORA (*Rinodina*) CONRADI (Koerb.) Nyl. Not. Sallsk. pro F. et Fl. Fenn. Forh. XI, (1871), p. 182.

On mosses over rocks, Republic, Wash.

Spores oblong or blunt-fusiform, at first colorless, but brown with age, three-septate, the regular cells enclosing quadrate nucleoli, $33 \times 12-18\mu$, hypothecium grayish, paraphyses distinct, discrete, the tips reddish, with the upper portion of the hymenium reddish downward.

Interesting as affording internal characters in complete accordance with those of the European plant. The thallus is comparable with that of *L. turfacea*, and wholly irreconcilable with that of the Californian plant described in Tuckerman's Synopsis, p. 210.

BIATORA CINNABARINA (Sommerf.) Fr. Lich. Eur. Ref., p. 266.

On bark of *Tsuga*. Mt. Ellinor, Wash., alt. 4,000 ft., No. 2107.

Spores oblong, $10-12 \times 3-4\mu$.

Reported from British Columbia and Oregon, but almost unknown to our American collectors.

Biatora myriocarpella, sp. nov.

No visible thallus, but the fibres of the substratum afford hyphema, and nestling among the filaments, algae. Apothecia minute (about 0.25 mm.), very numerous, sessile, from flattish to strongly convex, immarginate, the disk from dark brown to more commonly blackish, scabrous and epruinose. Spores eight in each ascus, from ellipsoid to oblong, predominantly simple, but sometimes thinly septate, colorless, $8 \times 4\mu$, hymenium and hypothecium hyaline, paraphyses gelatinous, the tips dark or purple, asci ventricose-clavate.

On cedar fence posts, Gate, Wash., No. 1987.

Comparable with *B. turgidula*, but the hypothecium colorless, the apothecia smaller and more abundant, and the spores discrepant.

Type specimen in herb. Merrill; co-type in Mr. Foster's collection.

Biatora (Biatorina) pilularis (Koerb.) comb. nov.

Thallus from white to sordid-whitish, thin, finely granulose, effuse, K—, C—. Apothecia small (about 0.3 mm.) adnate, soon convex or even sub-globose, yellowish-flesh or brick-red colored, without visible margin. Spores eight in each ascus, ellipsoid, colorless, one-septate, $7-10 \times 3.5-4\mu$, hymenium and hypothecium hyaline, paraphyses distinct, compacted, wholly without color at the tips, asci ventricose-clavate, with the apical wall thick, hymenial gel. with I. + blue above, wine-red below.

On bark of aspen. Republic, Wash.

Spores smaller than in the recorded measurements for the European specimens, and more like those of *B. cyrtella*. New to America.

LECIDEA (*Buellia*) PAPILLATA Fr. Lich. Eur. Ref., p. 336.

On thin earth over rocks, Republic, Wash., No. 2299.

Spores oblong-ellipsoid, ellipsoid or blunt-fusiform, one-septate commonly, three-septate rarely, $30-40 \times 11-15\mu$, hymenium colorless, hypothecium brown, paraphyses distinct, lax, tips brown, the asci ventricose with the apical wall very thick.

Remarkable for its excessively large spores. Previously recorded from Washington.

LECANACTIS ILLECEBROSA var. **megaspora**, var. nov.

Thallus whitish or white, thin, more or less pulverulent, K—, C—. Apothecium medium in size, from brown soon blackening, plane at first, then convex, or the larger ones umbonate, with a thin more or less persistent margin, disk naked or white-pruinose, the margin for the most part epruinose. Spores, eight in each ascus, fusiform, one-three septate, the cells regular, $28-33 \times 5-6\mu$ hymenium colorless, hypothecium brown, paraphyses distinct, tips dark, hymenial gel. with I. + wine-red.

On cedar bark, Near Elwha P. O., Wash., No. 1765.

Related to the species through its thin, apothecial margin, fusiform spores, color and consistency of thallus and reaction with Iodine. Differentiated in the color of its larger apothecia, and larger spores. Type specimen in herb. Merrill; co-type in Mr. Foster's collection.

OPEGRAPHA VARIA var. *LUTESCENS* Mudd Man., p. 230.

Thallus variously whitish or sordid. Apothecia as in the species, but with the margins greenish or yellowish-pruinose. Spores fusiform or with one end rounded, five septate, $25-29 \times 7\mu$.

On maple bark, Renton, Wash., No. 2086. I know of no other record for this Country.

VERRUCARIA LAEVATA var. *NIGRITA* Leight. Li. Fl. G. Brit. ed. III, p. 449.

Thallus blackish, smooth, rimulose. Apothecia immersed in the thallus, only the apices visible, rather numerous and not large. Spores ellipsoid, simple, $14-23 \times 7-10\mu$.

On rocks touched by the waters of Hoods Canal, Hoodspout, Wash., No. 2130. No previous record found for America.

ROCKLAND, MAINE.

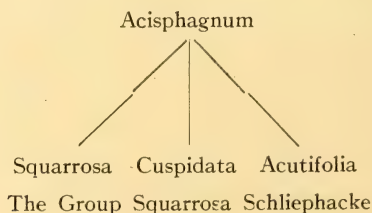
NOTES ON NORTH AMERICAN SPHAGNUM. V

A. LEROY ANDREWS

The Section *Acisphagnum* Carl Müller

This large section shows, as already intimated, the greatest differentiation of structures: stem and perichaetial leaves, antheridial leaves, leaves of pendent branches, leaf-border, cortical cells of stem and branches, all mark the section as representing a higher stage of development than the preceding ones. That it embraces a greater number of species and that these, while varying much among themselves, present the most difficult problems of distinction and relationship is hardly to be wondered at. The most distinctive character of the section as a whole is the differentiation of retort-cells in the branch-cortex. It may be further noted that the antheridia are borne on catkin-like parts of the spreading branches with antheridial leaves usually pigmented red or brown according to the species, these leaves differing from the other branch-leaves frequently also in size and shape, in pores and particularly in that the hyaline cells of the lower part of the leaf lack pores and fibrils. The branch-leaves are regularly bordered, normally by two (sometimes more) rows of long narrow cells.

The species are widely distributed over the whole world. Phylogenetically at the head of the section stand, as it seems to me, some half dozen species, sharply distinct from each other, but showing at same time a certain kinship. There must then have been a considerable loss of ancestral forms. All of the species last referred to are boreal in their distribution. Some of them have given rise to considerable lines of development, including species that have achieved a much wider distribution and themselves thrown off secondary derivatives of more restricted range, while other have remained isolated and unproductive. Whether one regards the last as monotypic "groups" or includes them in other groups with which they show the closest relationship is largely a matter of individual choice. It is then in no substantial disagreement with Schliephacke's and Russow's arrangement of the European species of *Sphagnum* (Warnstorff's arrangement of the non-European species is, as already noted, unnatural) that I divide the American forms of *Acisphagnum* into three groups: *Squarrosa*, *Cuspidata*, *Acutifolia*. Where this involves any deviation from current usage my reasons will be given in the discussion of the individual species. It may be said that the form (in section) of the chlorophyll cells of the leaves can not be used as an absolute diagnostic character of the group, as the original type of cell with central lumen and approximately equal exposure on both surfaces of the leaf may occur within any group and actually does occur in them all, and there is often some little variation within a single species. The highly specialized stem-leaves and perichaetial leaves seem to me to furnish the most readily perceptible indications of group-relationship. To name the one character that appears most conclusive, not as a practical means of separating the groups but in its real indication of natural relationships: it is the disposition of those membrane-gaps in the hyaline cells of stem-leaves and perichaetial leaves commonly characterized as "resorption" of the membrane. The stem-leaves of the species of *Squarrosa* show such "resorption" mostly on the outer surface (as in *Inophloea*), those of *Cuspidata* and *Acutifolia* mostly on the inner surface (as in *Malacosphagnum*). Certain of the phylogenetically old species show resorption of the membrane on both surfaces, which accounts for the characteristic lacerate condition of the stem-leaves of these species. In the perichaetial leaves such membrane-resorption can be present only in case at least a portion of the leaf shows the normal leaf-structure of alternating hyaline and chlorophyll cells and then only in such hyaline cells as are non-fibrillose. When these conditions are present, and they are in most species of *Acisphagnum*, one will find in *Squarrosa* membrane-gaps on the outer surface, in *Cuspidata* on the inner, in *Acutifolia* on neither. The relationship of the three groups could be illustrated approximately thus:



The group-name *Squarrosa* seems to have been first used by Schliephacke¹ and has persisted mostly with the same content since. My only change is the addition of *S. Ångströmii* which has been passed from group to group and by Russow with clearer insight made a group by itself: *Truncata*.² The most noteworthy characters of the group *Squarrosa* are to be found in the stem-leaves and perichaetial leaves as already noted. Its distribution is circumpolar, restricted to the northern hemisphere, the southern limit in North America corresponding roughly with the limit of glaciation.

10. *Sphagnum Ångströmii* Hartmann, 1858. The similarity of the stem-leaves of this species with those of *S. squarrosus* and *S. teres* will be apparent to anyone from the excellent illustrations of Roth,³ and a careful examination will show that this generally similar effect is accompanied, probably in part conditioned by a similar tendency in the resorption of the membrane of the hyaline cells, these species being unique among *Litophloea* in showing a great resorption upon the outer surface of the stem-leaves with very little upon the inner. The perichaetial leaves of *S. teres* and *S. squarrosus* are still more unique among *Litophloea* in that they show throughout their whole extent the normal network of chlorophyll and hyaline cells with fibrils completely lacking and with general resorption of membrane on the outer surface. A fruiting specimen of *S. Ångströmii* from the Sullivant herbarium, loaned me through the kindness of Professor Farlow, showed perichaetial leaves with the two kinds of cells differentiated in the upper and middle portions, where the hyaline cells were without fibrils and had their membrane resorbed on the outer surface, corresponding then in this last respect with the other two species. Of course the tendency to uniform narrow cells in the lower part of perichaetial and stem-leaves of *S. Ångströmii*, the different pores and chlorophyll cells of its branch-leaves, and its different gross appearance indicate that its relationship to the other two species is not an extremely close one, probably not closer for example than that between *S. teres* and *S. Girgensohnii*, but that its nearest affinity is with *S. teres* and *S. squarrosus* seems indubitable. It is to one familiar with *Sphagnum* recognizable immediately in the field by its generally yellow coloration and the effect produced by its large but relatively short leaves, a gross effect quite intermediate between that of the species of *Inophloea* and of most species of *Acisphagnum*, while its coloration and habit is hardly that of *Malacosphagnum*. If one is tempted to confuse it with *Inophloea*, which is most likely to be the case, a hand-lens is sufficient to distinguish its broadly truncate leaf-apices from the cucullate ones of *Inophloea*. It is known in North America from two collections, both mentioned by Warnstorf in his last book:⁴ Hall Island in Bering Sea, collected by Trelease;⁵ Yukon, collected by J. M. Macoun; the last at about 64° north latitude, the first

¹ Beiträge zur Kenntnis der Sphagna 413. 1865.

² Zur Anatomie der Torfmoose 29. 1887. Russow had previously (Beiträge zur Kenntnis der Torfmoose 34. 1865.) included in *Truncata* two other species.

³ Die europäischen Torfmoose, pl. IV, fig. 3a; pl. V, figs. 1a, 2a.

⁴ Pflanzenreich 51: 139. 1911.

⁵ Cf. Harriman Alaska Series of the Smithsonian Institution, V, 332. 1910.

at slightly above 60°. I have seen a portion of Trelease's collection in the herbarium of the New York Botanical Garden, a portion of that of Macoun was kindly given me by Warnstorf. That the species has not yet been found in Greenland is remarkable. In Europe and Asia it is not altogether uncommon in the proximity of the Arctic Circle, the only locality at less than 60° north latitude being a somewhat isolated station discovered by Russow at Kasperwiek in Esthonia (Russia),¹ and this apparently only between the 59th and 60th parallels. Its distribution in Scandinavia is admirably shown by Dusen's map.² During the summer of 1912 I was so fortunate as to find the species in Norway and at the same time to somewhat extend its range of known distribution in that country. It was noted in several tufts on the mountain side near the Hotel Vatnahalsen, a short distance from the station Myrdal on the railroad Kristiania-Bergen, and specimens taken as a record. This station is in approximately 60° 30' north latitude, the most southerly in Norway hitherto having been in the Gudbrandsdal at about 61° 50' north latitude, an extension then of over a degree of latitude. It is also remarkable as being on the western side of the Norwegian watershed or divide, the species in Norway seeming to avoid the proximity of the Atlantic Ocean.

(Concluded in September Number)

NINTH PUBLIC MEETING OF THE SULLIVANT MOSS SOCIETY

According to the announcement in the May BRYOLOGIST our Society was the guest of the Brooklyn Botanic Garden and the Central Museum on Saturday, May 24th. The weather was somewhat uncertain, but the real business of the day was not interfered with by the showers which fell at intervals.

Miss Susan Hutchinson, Librarian of the Central Museum, placed the Periodical Room at our service for the day, arranged for our inspection rare and interesting books, and made a most delightful hostess. The first item on our program was given by Dr. Grout, in the Assembly Hall of the Museum Building, it being an abridgment of his "Lantern Talk on the Mosses." After this was over we adjourned to the cosy Library Room and Dr. Evans, taking the chair, presented in brief two papers, one by Miss Caroline Coventry Haynes "The First Supplement to the Sullivant Moss Society Exchange List of Hepaticae of United States and Canada," and the other "New and Interesting Lichens from the State of Washington" by Mr. G. K. Merrill. This was followed by a paper by Dr. Otto E. Jennings on "Notes on the Mosses of Western Pennsylvania," read by Mrs. Annie Morrill Smith. Mr. Edward B. Chamberlain followed, reading a paper by Miss Annie Lorenz on "Notes on Maine Hepaticae and a comparison with the Sarekgebirge Hepaticae."

¹ Cf. Russow, Zur Kenntn. d. Subsec. u. Cymbif. Gr. europ. Torfm. 136. 1894.

² Om Sphagnaceernas Utbredning i Skandinavien. 1887.

Our sixth item was to have been a paper by Dr. George H. Conklin, but as no manuscript had come to hand, nor any explanation, it was omitted! The next morning's mail brought a night-telegraph letter, containing "congratulations and best wishes for all present." Paper by title only. "The Hepaticae of Isle Royale." This was by ill fate addressed to the writer, Care Sullivan Moss Society, New York Botanical Gardens, the Bronx, New York. No wonder it took some time to arrive at its Brooklyn destination. We were all sorry not to enjoy its perusal, but this with the other papers will be published in future numbers of *THE BRYOLOGIST*. This concluded the program part of the day. We then took our way to a restaurant not far distant. Mr. Morris entertained us at luncheon, a long table having been prepared for us, and a jolly hour was passed in ministering not only to the inner man, but in pleasant converse. The rain still holding off, we returned by way of the Botanic Garden, Dr. C. Stuart Gager, its Director, Mr. Norman Taylor, the Curator of Plants, and Dr. Edgar W. Olive, Curator of Public Instruction, acting as our guides. We effected an entrance to the buildings under construction, this being Saturday afternoon and the workmen gone. We obtained a very good idea of the rooms and general arrangements for work in the Laboratory building, which is of re-enforced concrete, and seems to embody the very latest word on the subject. The first glass house adjoins, and together these will give opportunity for the starting of laboratory work in the fall.

The Botanic Garden was a revelation to those of us who had not been over the ground since it was a part of the dumping grounds of Brooklyn. The present site of the Lake used to be a local skating-pond in winter, and mosquito-breeding place in summer. It may also be of interest to friends of our late member, Mrs. Carolyn W. Harris, to know that part of the property was owned by her husband and herself and only sold shortly prior to their death.

On returning to the Museum Building, Mr. E. L. Morris, Curator of the Natural History collections, took us in charge and showed us the Herbarium and its treasures. The afternoon closed by a walk through some of the general rooms of the Museum, including, through courtesy of Mr. Fox, the room displaying the new collection of Japanese costumes. This had, on the Wednesday preceding, its first private view, tendered to the Japan Society of New York. We felt much honored to have this attention. The day closed with inspection of an exhibit of photographs of botanists, not only those of general interest, but of some of our absent Society members as well—also prints of interest. The wonderful drawings of New England Hepaticae by Miss Lorenz must not be forgotten. This precious book was entrusted to the care of Dr. Evans, and we were all charmed with the artistic work, as well as by its scientific worth. It contains all the species now credited to the range, New England.

It was a great pleasure to have Mrs. Elizabeth G. Britton and Dr. M. A. Howe with us, giving us chance to entertain our former hosts of the New York Botanical Garden on the occasion of our second meeting, June 27, 1900. Mrs. Britton, it should be remembered, originated these public meetings with the one at Columbus, Ohio, August, 1899, the year after our organization.

Prof. J. Franklin Collins was in town on business, but took an hour and joined us for part of the afternoon. Altogether the day was one of real enjoyment and profit. The entire staff of the Garden and the Museum have placed us under their debt,—all we can do is to thank them most heartily.

May 27th, 1913.

ANNIE MORRILL SMITH.

EDITORIAL

The September number of THE BRYOLOGIST will probably be issued somewhat late. The Editor and his wife will spend the summer botanizing in the region northwest of Lake Superior. Mail for THE BRYOLOGIST will be forwarded from the Pittsburgh address.

EXCHANGE DEPARTMENT

Offerings—To Members Only, for Stamped and Self-addressed Envelope.

Mrs. Annie Morrill Smith, 78 Orange St., Brooklyn, N. Y.—*Dicranoweisia cirrhata* Lindb., collected near New Westminster, British Columbia, and *Collema nigrescens* (Huds.) Ach., collected in California.

Rev. H. Dupret, Seminary of Philosophy, Montreal, Canada.—*Hypnum stellatum* Schreb., sterile; *Hypnum ochraceum* Turn., sterile; and *Hypnum reptile* Michx., *cfr.* "U. S. postage accepted."

Dr. H. E. Hasse, Santa Monica, Cal.—*Rinodina angelica* Stizenb. and *Lecania brunonis* (Tuck.) Herre, both from California. Enclose four cents in stamps for these specimens.

Mr. E. B. Chamberlain, Round Pond, Maine—*Bryum Bohnhofii* C. Mull. *st.*, collected by Max Fleischer in Ceylon.

Mr. George B. Kaiser, 508 Locust Ave., Germantown, Pa.—*Brachythecium caespitosum* Dixon = *Scleropodium caespitosum* (Wils.) B. & S. Collected in England by W. E. Nicholson.

Mr. George L. Kirk, 18 E. Washington St., Rutland, Vt.—*Candelaria concolor* (Dicks.) Wainio var. *effusa* (Tuck.).

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 SEPTEMBER 1913
 

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CONTENTS

North American Species of the Genus *Ramalina*

R. Heber Howe, Jr. 65

Notes on North American *Sphagnum* Y (*Concluded*)

A. LeRoy Andrews 74

Noteworthy *Lecideaceae* from Knox County, Maine

(*To be concluded*)

G. K. Merrill 77

Notice of Election of S. M. S. Officers for 1914 80

Riccias Desired for Naming. *Marshall A. Howe* 80

Exchange Department 80

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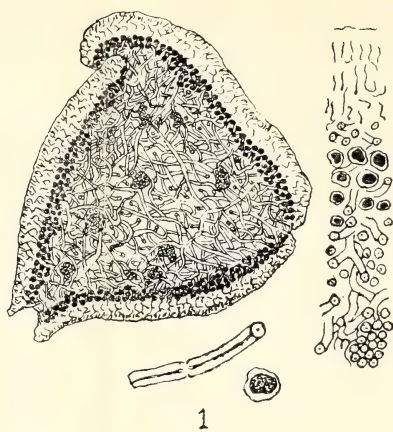
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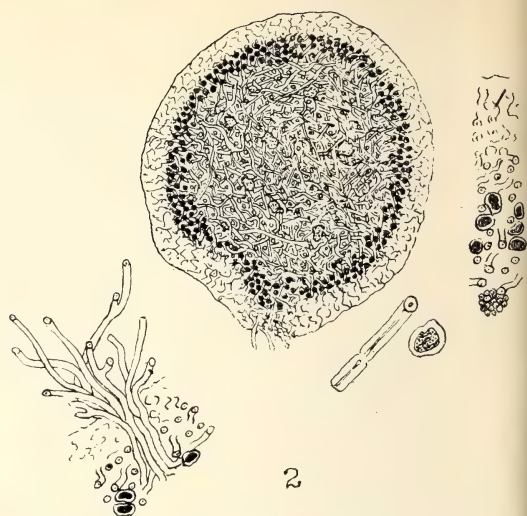
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THE BRYOLOGIST

VOL. XVI

SEPTEMBER 1913

No. 5

NORTH AMERICAN SPECIES OF THE GENUS RAMALINA

R. HEBER HOWE, JR.

During the eight years that I have been studying the species of the family *Usneaceae* and publishing papers on four of its genera, I have been collecting data on the present genus, realizing that it was one of the most difficult of the family, and until I could study the European types, it was quite impossible to prepare a thorough continental monograph. A year in Europe in 1911-12 gave me this opportunity and I have now traced all the preserved types of which I can secure information and have seen sufficient material to gain a knowledge of the distribution of species.

Our species of the genus *Ramalina*, since 1753, have appeared under the following genera: *Lichen* L., 1753; *Physcia* Pers., 1794; *Lobaria* Hoffm., 1795; *Parmelia* Ach., 1803; *Alectoria* Ach., 1810; *Borreria* Ach., 1810; *Usnea* Tayl., 1847; *Desmaziera* Mont., 1852; and *Cenozosia* Mass., 1853. These comparatively few genera for such a large and diverse group shows the little difficulty lichenologists have found, particularly since 1853, in recognizing the characteristics of the genus. The species, on the other hand, have always presented a most difficult problem, caused largely no doubt by the innumerable intergrades that present themselves, and by the unwarranted description of new species.

The genus has received in Europe notable attention, the four following papers being particularly important: Speerschneider, Mikros. anat. Ram., Bot. Zeit. Jahrg. 13: 345-385. 1855; Nylander, Recogn. monograph. Ramalinarum, Bull. Soc. Linn. de Norm., 2 ser. 4: 101-180. 1870; Stizenberg, Bemerkungen zu den *Ramalina*-Arten Europa's, Jahresber. d. Naturf. -Ges. Graubündens 34: 77-130. 1891; Brandt, Beitr. zur anatomischen Kenntniss der Flechtengattung *Ramalina*, Hedwigia 45: 124-158. 1906. Mr. G. K. Merrill, Bryologist 11: 48-53, 1908, has given us an excellent brief review of the commoner North American species, contrasting the Tuckerman and Nylander conceptions.

There has been comparatively little done so far toward the typification of lichen genera, but it is *not* necessary for the retention of *Ramalina* to treat it as a *nomina conservanda*, as Prof. Bruce Fink has intimated (Lich. Minn. 224, 1910). Though Persoon's *Physcia* of 1794 antedates Acharius' *Ramalina* of 1810, Schreber proposed the genus *Physcia* in 1791 (Gen. Plant. 2: 767. 1791). The Acharian genus was well made and it is remarkably coherent, and it is a satisfaction to know that a change which would involve so much confusion is unnecessary.

GENUS *Ramalina*¹ Ach. Lich. Univ. 122 et 598. 1810.

DESCRIPTION: *Thallus* caespitose or pendulous, branched; *cortex* glabrous, striate, papillate, rugose, (puberulent?) or ciliate (in one species); structure complex (decomposed); *lacinae* terete, subterete, compressed, or reticulate; virescent to stramineous (rarely dichroic); medulla arachnoid, axis loosely arachnoid (or partially chondroid in a few species). Gonidia stratified (heteromerous), *Protococcoid*. Soredia or soralia normal. *Cephalodia* occasional, pale.

Apothecia terminal, subterminal, marginal or lateral; scutelliform, applanate or concave, rarely convex or lacerate; marginate, disk pale. *Asci* clavate, containing eight spores; paraphyses gelatinous, slender, apices crassate. *Spores* bilocular, rarely tri- or quadri-guttulate, hyaline, straight or curved, ellipsoid or fusiform (rarely bistort). *Spermogones* subimmersed or papillate, dark or pale. *Sterigmata* simple, rarely articulate. *Spermatia* cylindrical, apices obtuse.

OBSERVATIONS: In my papers on the other genera of this family I drew for myself the arbitrary line of the 15th parallel north latitude, and this has forced upon me the consideration of many extratropical species, our field and distributional knowledge of which is seriously lacking. I shall therefore do little more than list the species that have been attributed to Mexico and the Greater Antilles. The material representing the same comprises rarely more than the types. It is interesting to note that almost more species (12) have been described from Mexico and Cuba than from all the rest of North America. In this connection, for example, the genus *Usnea* is represented in North America proper² by only eight distinct species, and in Europe by only nine, whereas from the continents of South America, Africa, Asia, and Oceania one hundred and ten species at least have been described. The reason is not far to seek. The problems of distribution have met with little correlated study, the types are scattered, the described species insufficiently known,—consequently many of the specimens of each small collection that find their way to the botanist, in the absence of comparable material and distributional knowledge are described as new. It is for this reason that in the family *Usneaceae* I am confining my work to North America.

The sections already proposed by Drs. Stizenberg, Steiner, and Wainio do not seem to me particularly satisfactory. One, *Corticatae* Stnr., B. includes such diverse species as *ceruchis* and *Duriaei* their homology being only in a none too well marked cortical structure—which in the entire genus is of the one, *decomposed* type. In fact the members of the genus show but little variation in the essential thalline characters, which undoubtedly explains, as has been said, not only how easily the genus has been recognized, but also the great difficulty in distinguishing species. There are but two really distinctive characters,—one made use of by Tuckerman, the chondroid axial filaments (almost of generic importance) of *ceruchis* and *homalea*,—the other that of spore form. As I have used spore characters, outside of septation, for sectional distinction, they seem to offer again here the most natural division. All measurements and descrip-

¹ *Ramalina* = twigs, shoots—Latin *ramale*.

² See Proc. Thoreau Mus. Nat. Hist. 1: 15-25. 1913.

tions given for species in the present paper refer to plants collected in North America only.

The following herbaria have been examined in the preparation of this work: Sullivant Moss Chapter, Prof. Bruce Fink's, Carnegie Museum, Wellesley College, Academy Natural Science, Dr. L. W. Riddle's, Dr. A. C. Herre's, Dr. H. E. Hasse's, Boston Society of Natural History, Sprague, Taylor, British Museum, New York Botanic Garden and Kew (in part), Museum d'histoire naturelle, Cosson, U.S. National, Victoria Memorial, and the Author's.

SECTION: *Ellipsosporae* R. H. Howe, Jr., Class. Fam. *Usneaceae*, l. c. 17. 1912.

Asci containing 8 hyaline, ellipsoid or oblong spores $\frac{9-20}{3.5-7.5}\mu$.

SERIES: *Desmazierae* (Mont.) Ann. Sci. Nat. **18**: 303. 1852. (*Corticatae* Stnr. Oesterr. Bot. Zeitsch. **54**: 351. 1904.)

Axis with more or less chondroid, coalescent hyphae, cortex thin (50-60 μ) hyphae not divaricate above gonidia. Spermogones dark.

The plants of this *Series* show an enormous variation, due to age and character of substrata. Only two distinct types are, however, evident—the two-edged and the subterete. Of these there are those modified by a somewhat constant apothecial position either lateral or terminal and further modifications are seemingly only of growth. The spores of all the species are inseparable.

Key to the Series (*Desmazieræ*)*

Thallus rigid

Laciniae terete or subterete

Apothecia mostly lateral

Branches stout (2 mm. diam.)

Esoraliat..... *ceruchis*

Soraliat..... f. *cephalota*

Branches slender (1 mm. diam.)..... v. *tumidula* [*humilis*]

Apothecia terminal, corymbose..... *comeboides*

Branches stout (4 mm. diam.)..... v. *robusta*

Laciniae subcompressed, angulate or compressed (2-edged)

Apothecia lateral

Thalline exciple rugose..... *homalea*

Thalline exciple smooth..... v. *disrupta*

Apothecia terminal, aggregate

Branches wide (8-10 mm.)..... *testudinaria*

Branches narrow angulate, lacunose.. v. *intermedia*

Thallus lax..... *flaccescens*

All specimens show a more or less pale yellow reaction to KOH and hyemium blue with I. Those on mineral substrata show the most pronounced yellow with KOH.

* A general key of all species will be given at the end of this paper.

Ramalina homalea Ach. Type species of the genus.

SYNONYMY: *Ramalina homalea* Ach. Lich. Univ. 598. 1810.

TYPE: In the Acharian herbarium, Universitetets Botaniska Institution, Helsingfors, *vide* Dr. Fred Elfving. No duplicate material is in the Linnean Society herbarium at London *vide* author.¹

TYPE LOCALITY: "In rupibus Californiae." Menzies.

ORIGINAL DESCRIPTION: "thallo compresso ancipiti laevigato nudo ramoso albo-pallescente transversim subrimoso, ramis dichotomis attenuatis; apotheciis sparsis centro affixis concaviusculis subimmarginatis concoloribus." *l. c.*

FIGURE: Ach., *l. c.*, Pl. XIII, f. 5. and Pl. VII. f. 1.

DIAGNOSIS: *Thallus* caespitose, compressed, attenuate, rigid; transverse-rimose, apothecia lateral, spores straight or substraight.

DESCRIPTION: *Thallus* caespitose (max. length 12 cm.) rigid, pale virescent to stramineous, becoming reddish in herbarium; cortex glabrous, nitidous, sparsely transverse-rimose or rugose (rarely punctate with black spermogones); laciniae compressed, two-edged, subsimple or branched, now laterally digitate (max. width 6 mm.), apices attenuate. *Apothecia* common, lateral, applanate or concave, marginate, at length lacerate (max. diam. 8 mm.), thalline exciple rugose, disk concolorous or pale. *Spores* oblong, straight or substraight, $\frac{9.7-19}{3-5} \mu$.

CONTINGENT PHASES: (a) Margins of laciniae isidiiferous. (*R. homalea* f. *isidiosa* Willey MS. (b) Blackening.

SUBSTRATA: On maritime rocks (sandstone, granite) and trees?

DISTRIBUTION: Common in the Transition Zone on the Pacific Coast from Guadalupe Island, Lower California and Mexico, to San Francisco. It has been collected inland two miles at Pilarcitos Creek cañon (250 ft.) and on San Bruno Mt., at an elevation of 1,300 feet.

STATIONS : CALIFORNIA : San Mateo Co.; Californian archipelago; San Diego; Pilarcitos Creek cañon; Pt. Lobos; San Bruno Mt.; San Francisco Bay; Pt. Como; Mission Dolores.

LOWER CALIFORNIA: Guadalupe Island; Coronados Island.

MEXICO: (No locality given.)

OBSERVATIONS: This species is generally easily recognized on account of its rigid, compressed, two-edged, rimose, never pitted, and rarely floccose thallus. *R. homalea* represents the most internally chondroid common to our area.

EXSICCATI: No. 92. Decades No. Amer. Lich., Cummings, etc., "San Mateo Co., Cal.," Feb. 17, 1893. M. A. Howe.

No. 2. Lich. Boreali-Amer., Cummings, etc., data as above.

NOTE: *Ramalina homalea* var. *disrupta* Nyl. *Recog. mono. Ram.* 108 [10 1870. The Abbé Hue includes this variety from California. (*Lich. Exoti.* 53

¹ Bull. Torr. Bot. Club. 39: 203. 1912.

1891). I have not observed the variety, which Nylander defined as follows: "Variat haec Ramalina cortice distincte transversim rimoso et hinc inde obsolete lacunos-inequali, var. *disrupta*, accedens ad sequentem, a qua differt praecipue receptaculo laevi." It appears to be only a contingent phase at best, differing because of its smooth thalline exciple.

Ramalina testudinaria Nyl.

SYNONYMY: *Ramalina testudinaria* Nyl., Recog. mono. Ram. 108 [10]. 1870.

TYPE: In the herbarium of the Museum histoire d'naturelle, Paris, *vide* Author. Cotype in the Sprague herbarium, Boston Society of Natural History, Boston, *vide* Author.

TYPE LOCALITY: "California." Menzies.

ORIGINAL DESCRIPTION: "Thallus ochroleuco-pallidus vel stramineo-rufescens, rigens, compressus, anceps, lacunose plano-impressiusculus vel rarius sublaevigatus, cortice transversim aut demum areolatim rimoso, parum ramosus, apicibus attenuatis; apothecia carneo-testacea (interdum leviter albocaesio-pruinosa) marginalia vel subterminalia, mediocria vel majuscula (latit. 3-12 millim.), receptaculo lacunoso-rugoso subpedicellato et margine plicato-undulato rugoso tumescente; sporae oblongae rectae velleviter curvulae, longit. 0.010-15 millim., crassit. 0.003-4 millim." *l. c.*

FIGURE: Pl. VII, f. 2.

DIAGNOSIS: *Thallus* caespitose, *much* compressed, *non-attenuate*, *rigid*, *transverse-rimose*, apothecia mostly *terminal*, aggregate. *Spores* oblong, straight or substraight.

DESCRIPTION: *Thallus* caespitose (max. length 6 cm.) rigid, virescent to rufescent; *cortex* glabrous, transverse-rimose or rugose; *laciniae*, compressed spatulate, two-edged, subsimple or branched, expanded and digitate above or laterally (max. width 2.5 cm.), apices blunt-attenuate. *Apothecia* common, subterminal, or terminal, often aggregate, applanate or concave, marginate at length lacerate (max. diam. 10 mm.), thalline exciple rugose, disk concolorous. *Spores* ellipsoid, straight or substraight, $\frac{10-21}{3-6} \mu$.

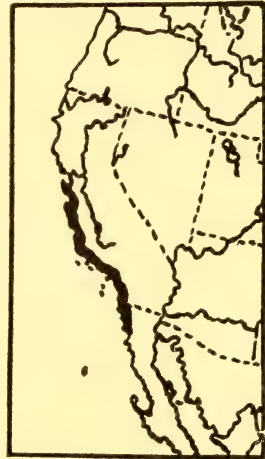


FIG. 1.—Distribution of *Ramalina homalea*, *R. testudinaria*, and their varieties.

CONTINGENT PHASES: (a) Angularly terete, lacunose (*R. testudinaria* v. *intermedia* Müll. Arg. Flora 40: 300. 1882.)¹

¹ Type in Herbar Boissier, Chambésy, Switzerland. "Laciniae primariae circ. 4 cm. longae .5-3 mm. latae, in sectione undique terestiusculae, caeterum undique acutius angulosae et foveolato—et plano-impressae, superne subinde brevi spatio 3-plo laterioris v. undique aequalis." In California.

SUBSTRATA: On maritime rocks.

DISTRIBUTION: Uncommon in the Transition Zone on the southern Pacific Coast. Seen only from the following stations:

STATIONS: CALIFORNIA: Pt. Lobos; Pt. San Pedro; Catalina Island; San Diego; Monterey.

LOWER CALIFORNIA: Guadalupe Island.

OBSERVATIONS: This Nylander species, not recognized by Tuckerman, seems possibly to deserve recognition as more than a phase of *homalea*. Its shorter, more spatulate, dull laciniae and terminal apothecia may deserve for it nomenclatural designation. It occurs with *homalea* and intergrades with the type. Neither Drs. Hasse or Herre, to both of whom we are indebted for so much of our knowledge of Californian lichens, have recorded the species. Several specimens in Dr. Hasse's herbarium are, however, referable to it. Both this and *homalea* rarely show the floccose condition described below.

Ramalina ceruchis (Ach.) DeNot.

SYNONYMY: *Parmelia ceruchis* Ach. Meth. Lich. 260. 1803.

Ramalina ceruchis DeNot. Frammenti Lich., Giorn. Bot. Ital. 2: 218. 1846.

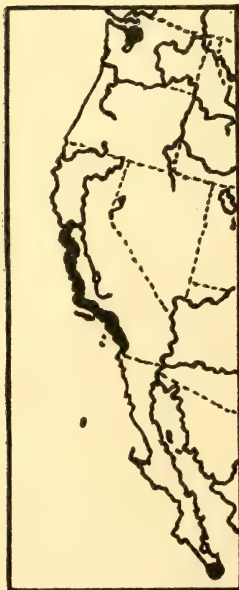


FIG. 2.—Distribution of *Ramalina ceruchis*.

TYPE: In the Acharian herbarium, Universitetens Botaniska Institution, Helsingfors, *vide* Dr. Fred. Elfving. Duplicate material is in the Linnean Society herbarium, London, *vide* author.

TYPE LOCALITY: "Peru. Ind. Orient. Koenig." Lima.

ORIGINAL DESCRIPTION: "thallo membranaceo albo-virescente ramoso, ramis vagis laxis inaequalibus subfasciculatis acuminatis; scutellis sparsis crassis disco plano albo-incarnato." *l. c.*

FIGURE: Pl. VII, f. 3.

DIAGNOSIS: *Thallus* caespitose, *subterete*, *attenuate*, *subrigid*, transverse-rimose, *black punctate*, apothecia *lateral*, spores straight or substraight.

DESCRIPTION: *Thallus* caespitose (max. length 8 cm.), subrigid, virescent, stramineous to orange or pale rufescent (dark below); *cortex* glabrous, transverse-rimose, subrugose, generally foveolate, punctate with black spermogones; *laciniae* subterete, simple or subsimple or sparsely branched (max. width 2.5 cm.) apices attenuate. *Apothecia* not uncommon, lateral, concave, applanate, or convex marginate, at length lobate (max. diam. 7 mm.), thalline exciple glabrous, disk buff, often pruinose.

Spores oblong, straight or substraight, $\frac{11-20}{3.5-5} \mu$.

CONTINGENT PHASES: (a) With bluish-gray, capitate soralia (*Ramalina ceruchis* f. *cephalota* Tuck. Synop. N. A. Lich. 21. 1882).¹

(b) Blackening.

(c) Deeply lacunose (*R. testudinaria* v. *humilis* Müll. Arg. Flora 40: 300. 1882.)²

SUBSTRATA: On shrubs, trees, old wood, and on maritime rocks (sandstone).

DISTRIBUTION: Not uncommon in the Transition Zone on the Pacific Coast from San Juan Island, Washington (Bryol. 14: 36. 1911,) to Mexico.

STATIONS: CALIFORNIA: San Francisco; Santa Barbara; Catalina Island; Point San Pedro; Point Lobos; Pigeon Point; Pacific Grove; Clifton; Golden Gate; Newport; San Diego; San Monica Mts.; Santa Cruz Island; Los Angeles Co.; San Clementi Island.

LOWER CALIFORNIA: Guadalupe Island; Cedros Island.

MEXICO: Tia Juana.

WASHINGTON: San Juan Island; Friday Harbor; Kanaka Bay.

OBSERVATIONS: This generally corticolous species may be distinguished from the two preceding by its subterete, more conspicuously punctate and less branched thallus. The older plants and those preserved in herbaria are often partially covered with a white or gray, cottonous, floccose down, resembling superficially a minute mould. This curious condition is explained (See Pl. V, f. 2.) by the medullary hyphae bursting through the rimose articulations. The common cephaloid, soraliate phase, probably due to a more moist rather than a sunlit exposure, does not deserve specific rank. It occurs only in the more slender corticolous plants, so far as I have observed.

EXSICCATI: No. 26, Lich. Exsic., Merrill, near San Diego, Cal. Sept., 1888. E. Palmer.

Ramalina ceruchis var. *tumidula* (Tayl.) Nyl.

SYNONYMY: *Usnea tumidula* Tayl. Hook. Jour. Bot. 6: 191. 1847.

Ramalina ceruchis f. *tumidula* Nyl. Recog. mono. Ram. 107 [9]. 1870.

Ramalina ceruchis var. *gracilior* Müll. Arg. Flora 46: 20. 1888.

Ramalina testudinaria v. *humilis* Müll. Arg. (?)

TYPE: Not preserved in the Taylor herbarium, Boston Society of Natural History, Boston, *fide* author.

TYPE LOCALITY: "Coquimbo."

ORIGINAL DESCRIPTION: "thallo cinero, subcaespitoso, erecto, filiformi, dichotomo, glabro-tuberculato, hic illic diffracto, intus albidissime stuppeo-fasciculoso, ramis ultimis brevibus, spiniformibus, apice nigris; gemme com-

¹Type in the Botanic Museum, Harvard University, Cambridge. "Large, lateral and capitate, grey soredia." "Santa Cruz" Anderson.

²Type in Herbar Boisser, Chambes, Switzerland. "Thalli laciniae 2½-3 cm. longae, undique in sectione teretiusculae et crebre alveolato-impressae, sterilis subulatae et arenatae, fertilis linearis et magis rectae, firmae." "In Californica insula Guadaloupe."

presso-granulatis, laevibus, demum pulverem albidum effundentibus; apothecii minutis, nudis, sessilibus, demum planis, pruinosis, concoloribus, margine demum crenulato." *l. c.*

OBSERVATIONS: This also corticolous variety, first described as an *Usnea*, appears to be only a slender, though the commonest phase of the type, (due to a latitudinal reduction) occurs throughout the range of the species and bears commonly the capitate soralia referred to under *ceruchis*. The Abbé Hue recorded this slender phase from Laguna (Lich. Cal. 2. 1895), his plant being slightly more slender than most of the material common to our area.

Ramalina flaccescens Nyl.

SYNONYMY: *Ramalina flaccescens* Nyl. Recog. mono. Ram. 109 [11]. 1870.

TYPE: In the herbarium of the Museum histoire d'naturelle, Paris.

TYPE LOCALITY: "Chile prope Coquimbo et in Peruvia, San Lorenzo."

ORIGINAL DESCRIPTION: Thallus ochroleuco-pallidus vel stramineo testaceus, molliusculus, compressus, lineari-laciniatus, lacunose plano-impressiusculus vel subreticulato-lacunosulus, laciniis (latit. 1-2 millim.) laciniato-divisis, apothecia pallida (caesio-pruinosa) minora (latit. 1-2 millims) receptaculo subtus sublucunoso-inaequali; sporae oblongae rectae vel leviter curvulae, longit. 0.012-16 millim., crassit. 0.0035-0.0045 millim." *l. c.*

OBSERVATIONS: I have seen but one specimen of this rather questionable species. It was collected at San Diego in 1882 by Dr. Ed. Palmer and is preserved in the Sullivant Moss Society herbarium (No. 349). The specimen is longer than cited by Nylander and has wider spores, in all other particulars agreeing with the original description.

Ramalina combeoides Nyl.

SYNONYMY: *Ramalina combeoides* Nyl. Recog. mono. Ram. 107 [9]. 1870.

TYPE: In the Nylander herbarium, Universitetets Botaniska Institution, Helsingfors, *vide* author. A topotype is in the Sprague herbarium, Boston Soc. Nat. History, Boston, *vide* author.

TYPE LOCALITY: "San Francisco," California. Bolander.

ORIGINAL DESCRIPTION: "Thallus osseo-pallidus vel stramineo-albidus teres, rigens, laevis (altit. 1-2 centim., crassit. 0.8-1.6 millim.), caespitose congestus, e stipitibus podetiiformibus simplicibus constans; apothecia pallidoglaucula vel albocaesio-pruinosa, terminalia, plana (latit. 2-4 millim.), fastigiata, receptaculo laevi; sporae oblongae leviter curvulae vel subrectae, longit. 0.011-15 millim., crassit. 0.004-5 millim." *l. c.*

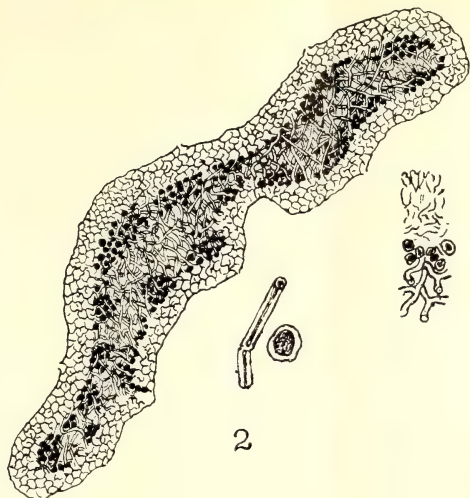
FIGURE: Pl.VII, f. 4.

DIAGNOSIS: *Thallus* caespitose, *terete*, *podetiiform*, rigid, transverse-rimose, apothecia *terminal*, spores substraight.

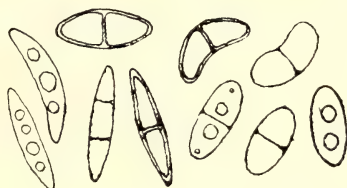
DESCRIPTION: *Thallus* caespitose (max. length 4 cm.), subrigid, virescent, stramineous or pale cinereus (dark below); *cortex* glabrous, transverse-rimose, sublacunose; *lacinae* terete or subterete, simple, podetiiform (max. width 2 mm.). *Apothecia* common, terminal, applanate, or convex, marginate (max. diam. 7 mm.), thalline exciple glabrous, disk buff. *Spores* oblong, substraight, 8-20 μ . 3.5-5 μ .



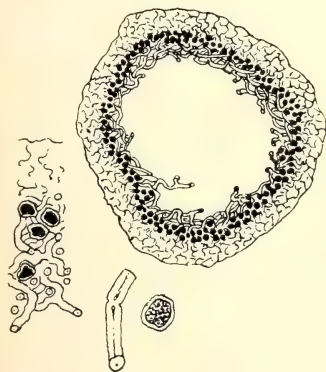
1



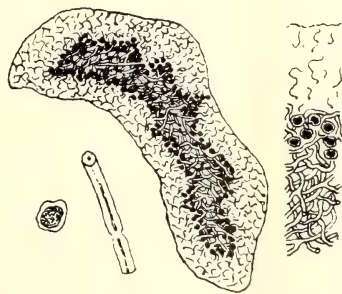
2



3



4



5

1



California.

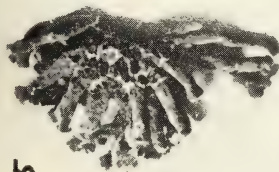
Ranadina hornalea

2

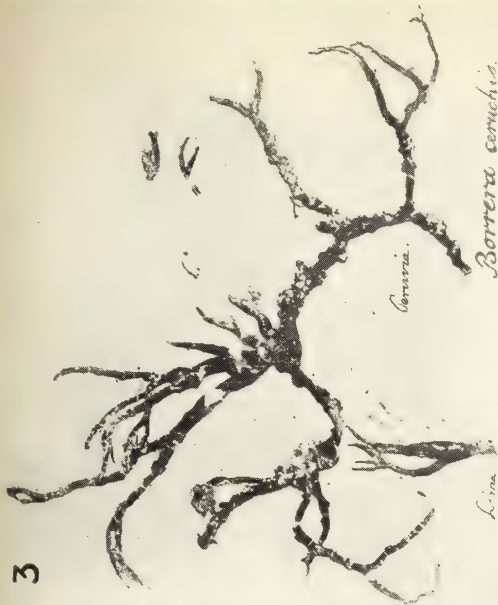


Route
California
Montgomery

5



3



Comua.

Lima

Borreria comucha.

R. combeorley

4

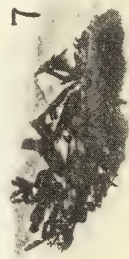
Nyl



6

ifornia
Francisco
saxicola.

7



Way. de Vinas

Bolander

CONTINGENT PHASES: (a) Laciniae deformed and deeply pitted, thalline exciple rugose. (See Hasse, Contributions U. S. Nat. Herb. **17**: 106. 1913.).

(b) Laciniae stout, swollen (*var. novo robusta*). TYPE: U. S. Nat. Herb., Agiabampo, Mexico, 1890. *leg.* Ed. Palmer. Similis *R. combeoidi* Nyl., thallus robustior, niger infra (altit. 1.5-2.5 centim., crassit 3-4 millim.), minutae faveolae; apothecia terminalia (latit. 5-7 millim.). Habitat in rupibus. Also seen from Guadalupe Island.

SUBSTRATA: On maritime rocks (sandstone, granite) and, it is said, on shrubs and trees.

DISTRIBUTION: Common in the Transition Zone on the Pacific Coast from Marin County to San Diego, California. It has been recorded inland two miles at Pilarcitos Creek cañon at an altitude of 250 feet.

STATIONS: CALIFORNIA: Monterey; Point San Pedro; San Mateo Co., Catalina Island; San Diego; Mission Dolores.



FIG. 3—Distribution of *Ramalina combeoides*.

OBSERVATIONS: This generally saxicolous species, distinguished by its more podetiiform growth and terminal, corymbose apothecia, was not recognized by Tuckerman. It is often difficult to separate it from *ceruchis*, with which it undoubtedly intergrades, and like *testudinaria* is of doubtful specific rank. There are even phases which approach *homalea* and others which have been referred to *humilis*. The examples of this and the type are always less rigid and typical if growing on wood; in fact the species seem to be largely based on the results of substratal growth.

EXSICCATI: No. 1, Lich. Boreali-Amer., Cummings, etc. "San Mateo Co." Cal., Feb. 17, 1893. M. A. Howe, called *R. ceruchis*.

No. 91, Decades N. A. Lich., Cummings, etc.—data as above.

No. 1369, Krypt. Exsic., Zahlbruckner, Pilarcitos Creek cañon, Cal., A. C. Herre.

[To be continued]

EXPLANATION OF PLATES V-VII

Plate V

1. Transverse section of the thallus of *Ramalina homalea* showing the coalescent hyphae of the medulla and the decomposed cortex of the cortical layer.
2. The same of *Ramalina ceruchis*.
3. Transverse section of an apothecia of *Ramalina canaliculata* showing exciple and the decomposed cortical layer.
4. Transverse section of the thallus of *Ramalina populina* showing the decomposed cortical layer and the arachnoid medulla and axis.
Enlarged 25 diam.—details 300 diameters.

Plate VI

Transverse sections of the thallus of the genus *Ramalina* showing the decomposed cortical layer and the distribution of gonidia.

1. *Ramalina rigida*.
2. *Ramalina Duriaei*.

3. *Ramalina* spores.
4. *Ramalina pusilla*.

5. *Ramalina usnea*.

Cortical layer 20–60 μ thick. Hyphae 2–9 μ in diameter. Gonidia 5–17 μ in diameter.

Plate VII

1. The Acharian type of *Ramalina homalea* at Helsingfors. (Slightly reduced.)
2. The Nylander type of *Ramalina testudinaria* at Paris. (Nat. Size.)
3. The Acharian type of *Parmelia ceruchis* at Helsingfors. (Slightly reduced.)
4. The Nylander type of *Ramalina combeoides* at Helsingfors. (Nat. Size.)
5. The Howe type of *Ramalina combeoides* var. *robusta* at Washington. (Slightly reduced.)
6. The Müller Arg. type of *Ramalina testudinaria* var. *intermedia* at Chambésy. (Nat. size.)
7. The Müller Arg. type of *Ramalina testudinaria* var. *humilis* at Chambésy. (Nat. size.)

NOTES ON NORTH AMERICAN SPHAGNUM. V (Concluded)

A. LEROY ANDREWS

11. *Sphagnum teres* (Schimper) Ångström, 1861. This type, distinguished as a variety of the one next following by Schimper in 1858, was regarded by Ångström as a separate species and bryologists have wavered between the two opinions ever since. While inclined from my own experience to separate the two specifically I realize fully their very close relationship. Warnstorf once inverted the relation of the two, making the following a variety of this species.¹ This procedure while nomenclatorially reprehensible was probably based upon a correct feeling for phylogenetic relationships. The two are most readily distinguished from other species of *Litophloea* by their large stem-leaves of elongated lingulate shape with broad and short hyaline cells without fibrils and with extensive membranous resorption on outer surface, the total effect being well represented by Roth's figures already referred to. Of the two *S. teres* is the more likely to be confused with other species, as in the field it looks not unlike such species as *S. Girgensohnii* or even *S. recurvum*, a fact obviously not without phylogenetic significance. These three species can however be readily distinguished in the wet state by an examination of the stem-leaves with a hand-lens and like all *Sphagna* are more easily distinguished when dry. Lindberg was the first to note² that the inner walls of the hyaline leaf-cells where overlying the chlorophyll cells are in both *S. teres* and *S. squarrosum* usually minutely papillose. The two species are separated from each other by quantitative macroscopic differences: the greater size of the plants and of some of their parts in *S. squarrosum* and the usually strongly squarrose branch-leaves of the latter species, its individual branch-leaves being then ovate-hastate while those of *S.*

¹ Die europäischen Torfmoose 121. 1881.

² Cf. Braithwaite, Sphagnaceae 62f. 1880.

Aeres are normally ovate-lanceolate. The pores in the branch-leaves of *S. teres* are usually fewer and larger in proportion to the size of the cells, and there are other minor differences. Somewhat intermediate forms cause difficulty however. Lesquereux described in 1868 a *S. squarrosulum* from California¹ which has by most botanists been treated as a variety (form) of *S. teres*, rightly so I should say from an examination of the original California specimens, though I have also seen small specimens of *S. squarrosulum* determined by botanists as *S. teres* var. *squarrosulum*. In fact I am inclined to think that *S. squarrosulum* under the influence of unfavorable local, seasonal, or other circumstances reverts to a type not easily separable from forms of *S. teres*.² I note that a Hungarian bryologist, Péterfi, still retains *S. squarrosulum* as an independent species,³ but the porose stem-cortex which, if I understand aright, characterizes his only specimen is quite abnormal for this group, nor do I find it present in our specimens of this form. Warnstorf emphasized a "biologic" point as separating *S. teres* and *S. squarrosulum*:⁴ that *S. teres* (excepting its variety *squarrosulum*!) prefers open moors, while *S. squarrosulum* is found in shady places and at most along the edges of swamps. The case is not dissimilar in North America, *S. teres* being found often in widely extended masses in bogs or wet meadows at the bases of mountains, etc., while *S. squarrosulum* occurs commonly in irregular clumps in more varied environment. I do not know however that the matter can be formulated into anything like an absolute rule. *S. teres* is often strongly pigmented brown. It is, so far as observed, dioicous and does not commonly fruit. Its distribution is quite similar to that of *S. squarrosulum*, reaching high latitudes in Greenland, Labrador and Alaska and extending south to something like the southern limits of glaciation, its southern limits as at present known extending through New Jersey, New York, Michigan, Colorado, California. Further collections fixing its southern limits more accurately are especially desirable. Its range in Europe and Asia appears to be similar.

12. *Sphagnum squarrosulum* Crome, 1803. The date of publication (1800) of this species given by Warnstorf and others seems to be doubly wrong in that the number of the periodical in question did not appear until 1801 and that the reference shows only a *nomen nudum* without description. A good description and figure was given in 1804 by Weber and Mohr,⁵ the authors again ascribing the species to Persoon. An adequate description appears however to have been published the year before by Crome in connection with a set of moss-exsiccati.⁶ So far as I know Crome did not ascribe the species to Persoon.

¹ Lesquereux's name had been applied earlier to European specimens, but without published description.

² Cf. also Loeske, Zur Morphologie und Systematik der Laubmoose 45. 1910.

³ Péterfi Márton, Magyarország Tözegmohai: Különlönyomat a "Növénytani Közlemények." 1904. 150.

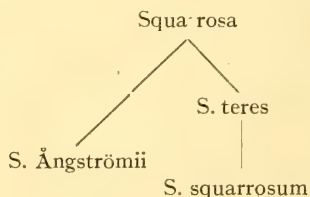
⁴ Kryptogamenflora der Mark Brandenburg, 1: 350. 1903.

⁵ Naturh. Reise durch einen Teil Schwedens 129, pl. 2, fig. 1 ab.

⁶ Cf. Dusén, Om Sphagnaceernas Utbredning 26. 1887; Lindberg, Europas och Nord Amerikas Hvitmossor 43. 1882; Botanische Zeitung 2: 321 ff. 1803.

This species is the one most easily recognized by beginners, thanks to its large size and usually very squarrose branch-leaves, and should in fact if normally developed be confused with no other. Its other characters have already been sufficiently dwelt upon. An interesting fact long since noted¹ is that corresponding to its robustness the cortex of the branches usually includes a second layer of empty cells (complete or partially developed). In contrast to the last species *S. squarrosus* is generally monoicous and fruits commonly and abundantly. Its distribution is essentially that of *S. teres*, but it is decidedly more common in the southern part of its range. Its present southern limit crosses the states: New Jersey, Pennsylvania, Ohio, Michigan, Wisconsin, Minnesota, Colorado, California.

As to phylogenetic relationship there remains not much to be said. Our results could be represented thus:



With reference to *Malacosphagnum* Dr. J. H. Barnhart has called my attention to the fact that *S. strictum* Sullivant should be dated a year earlier, as Sullivant's collection of exsiccati (with descriptions of new species) was published the year before the appearance of the pamphlet with descriptions, i. e. in 1845.² It may also be of interest to note a collection of this species in Norway earlier than previously reported. Reference by Dusén³ to a specimen collected by Wulfsberg (in 1874) on the island of Halsenö off the western coast of Norway and named by him *S. squarrosulum* which Dusén asserted was *S. compactum* led me to suspect *S. strictum*. Herr Kaalaas has very kindly looked up the specimen in the herbarium of Kristiania University, confirming my suspicion. A portion of the specimen sent me shows characteristic fruiting specimens of *S. strictum* Sullivant.

ITHACA, N. Y.

¹ Cf. already Schimper, Mém. Sphaign. and Vers. Torfm., pl. XVII, fig. 12. 1857, 1858.

² Cf. Amer. Journ. Sci. and Arts, 2d Series, I, 70. 1846.

³ Om Sphagnaceernas Utbredning 79. 1887.

NOTEWORTHY LECIDEACEAE FROM KNOX COUNTY, MAINE

G. K. MERRILL

The Lichens mentioned in this list, with one exception, were collected within ten miles of the City of Rockland. The determinations are based on careful microscopical examinations of the so-called fructification, and comparison with authentic specimens from European sources. Descriptions are given for those forms believed to be new to North America or the United States, and for others so far undescribed in any of our publications.

BIATORA COARCTATA var. *ORNATA* (Sommerf.) Th. Fr. Lich. Arctoi p. 190. (1860.)

Thallus indeterminate in our specimens, sordid gray, verruculose, marked at the circumference by sub-effigurate, irregularly-crenate squamaceous extensions. Apothecia small, concave or at length convex, the disk reddish-brown, with a rather tumid lighter colored margin. Spores 8, ellipsoid, simple, $22-27 \times 12 \mu$, in ventricose asci amidst distinct but slender paraphyses.

On slaty-schist, Mt. Megunticook, Camden. I know of no other record for the United States.

BIATORA ULIGINOSA var. *FULIGINEA* (Ach.) Fr. Lich. Eur. Ref. p. 275. (1831.)

On decaying logs; Warren.

This is a lignicoline condition of *B. uliginosa*, and, quoting from Fries, "crusto cum hypothallo confusa leprosa-granulosa fusco-nigrescens" exactly describes the thallus. There is little in the apothecia or spores to distinguish the variety from the species. The apothecia are more scattered and lighter in color, and the spores are said to be smaller, but my experience fails to verify the latter. Hypothallus blackish rather than black.

Dr. Fink found the plant in Minnesota on an old *Polyporus*, and it is reported from Newfoundland in Macoun's list of Canadian Lichens.

Biatora dilutiuscula (Nyl.) comb. nov.

Lecidea dilutiuscula Nyl. Flora 1876, p. 308.

Thallus effuse, continuous, smooth, grayish. Apothecia small, sessile, the disk plane with a thin concolorous margin, or convex and immarginate, waxy, livid, or yellowish-flesh colored. Spores 8, ellipsoid, hyaline, $7-10 \times 3.5-4.5 \mu$, wholly without color internally.

On rocks in the bed of a roadside rivulet, associated with *Lecidea contigua hydrophila* and other species, Camden.

Nylander in Lich. Env. Paris, p. 93, gives *Biatora Bauschiana* Koerb. as a synonym, and in Leighton's Mon. British Lich. Pt. II, p. 98, the var. *infidula* of *Lecidea sylvicola* is made equivalent. Our plant is not in agreement with either, but is entirely in accord with European examples of the species from France and Austria. So far as macroscopic examination permits judgment, the apothecia of all the species associated with our plant arise from the same thallus.

Unreported previously from America.

BIATORA ATORRUBENS (Fr.) Merl. Lich. Exs. No. 206. (1911.)

Lecidea parasema forma *atorrubens* (Fr.) Arn. Exs. No. 230.

Thallus small (-3 cm.) effuse, minutely granulose, ashy or ashy-green.

Apothecia small, sessile, crowded, entirely concealing the thallus at the centre, more or less convex, reddish-brown, the margin inconspicuous. Spores 8, oblong-ellipsoid, $8-10 \times 5 \mu$, hypothecium colorless, paraphyses distinct, epithecium infusate, asci ventricose.

On willow trunks, Rockland. Also detected in material from Nova Scotia.

Biatora (*Catillaria*) **Hochstetteri** (Koerb.) comb. nov.

Catillaria Hochstetteri Koerb. Parerga Lich. p. 195. (1865.)

Thallus thin, smooth or slightly irregular, brownish or ashy-brown, the color modified by the hypothallus. Apothecia sessile, plane, opaque, black, with a thin entire margin. Spores 8, ellipsoid, but with the terminations more or less acute, bilocular, colorless, $18-22 \times 10-11 \mu$, hypothecium brown, paraphyses distinct, diffuent, slender, the tips blackish or greenish.

On shaly rocks in a pasture, Rockport.

Apothecia more lecidiiiform than biatorine, but the exciple is not carbonaceous.

New to America.

Biatora (*Catillaria*) **grossa** (Pers., Nyl.) comb. nov.

Lecidea grossa Pers. in herb. Moug. et Nyl. Prodr. p. 139. (1857.)

Heterothecium grossum of Tuckerman Syn. Pt. II, p. 54.

On trunks of willows, Warren.

Reported from Newfoundland; Grand Manan Is., N. B.; Anticosti Is.; Cape Breton Is.; and the Gaspé region of Quebec, the plant seems known only in the United States as here mentioned, and from one station in Nebraska, T. A. Williams.

BIATORA (*Bilimbia*) **TRISEPTA** Naeg. ex Müller in Mem. Soc. Phys. Hist. Nat. Genev. 16: 404. (1862.)

Thallus effuse, granulose, grayish or dark. Apothecia minute (0.05 mm.) scattered or congregated, convex, black, the margin excluded. Spores 8, fusiform, three-septate, $19-24 \times 3-5 \mu$, paraphyses concrete, hypothecium colorless, asci ventricose.

On a pebble by the roadside, Camden.

Reported from Labrador by Arnold, and from New Bedford and Quincy, Mass., by Henry Willey.

BIATORA (*Bilimbia*) **SABULETORUM** var. **OBSCURATA** (Sommerf.) A. L. Sm. Mon. Brit. Lich. Pt. II, p. 143. (1911.)

The species is equivalent to *B. hypnophila* (Turn.) Tuck. of Tuckerman's Synopsis.

Thallus minutely rugose-granulose, pale ashy to white. Apothecia medium, numerous, at first concave or plane with a rather thick margin, but ultimately convex and immarginate, brown, reddish-brown, dark brown or sometimes black. Spores 8, ellipsoid or sub-fusiform three-septate, $17-30 \times 5-9 \mu$, paraphyses distinct, sub-coherent, tips yellowish-brown, hypothecium brownish, I + bluish > violet or wine-red.

On decayed wood, Warren.

Reported from Labrador, Newfoundland, Greenland and Alaska under various synonyms.

There is little to distinguish the variety from the species, the more obvious characters of separation consisting of constantly three-septate spores, larger and darker apothecia and their greater abundance.

LECIDEA PRASINULA (Wedd.) B. de Lesd. in Not. Lichenolog. No. VIII, Bull. Soc. Bot. Fr. p. 421. (1908.)

Lecidea parasema var. *prasinula* Wedd. Lich. "des laves l'Agde," p. 19.

Thallus effuse, irregular in outline and extensively spreading, granulose or granulose-areolate, sordid-yellowish or greenish, K + reddish-orange. Apothecia small, impressed, black, with a slightly elevated margin. Spores 8, ellipsoid, simple, $10-14 \times 8-9 \mu$, hymenium colorless, hypothecium brown, tips of the paraphyses greenish.

On shaded rocks, walls and ledges, Rockland, Rockport, and So. Thomaston. Often found but not common. New to America.

LECIDEA PRASINULA forma MAJOR B. de Lesd. in Not. Lichenolog. No. XIV.

Bull. Soc. Bot. Fr. p. 660. (1911.)

Thallus thicker than in the species, but similarly granulose-areolate and sometimes diffract, yellowish or greenish and somewhat sorediose, reaction as in the species. Apothecia relatively large, plane or convex, with a more or less flexuous border. Spores 8, ovoid-ellipsoid, simple, $11-15 \times 6.5-9 \mu$, the other internal characters as in the species.

On granite, So. Thomaston.

The apothecia are very similar to those of *L. platycarpa*, and the affinities of both species and form are with that species. New to America.

Description from the co-type in my herbarium.

LECIDEA SOREDIZA Nyl. in Bull. Soc. Linn. Norm. ser. 2. 6: 292. (1872.)

Thallus determinate, ashy-greenish, smooth, rimulose, besprinkled with rounded, scattered or crowded, flavescent soredia, K +, I + bluish in our specimens. Apothecia medium or large, scattered, at first plane, then convex, sometimes umbonate or proliferous, rounded or flexuous, the margin slightly elevated or excluded, disk black, often faintly pruinose. Spores 8, ovoid or ellipsoid, simple, $15-22 \times 7-9 \mu$, hypothecium thick and black, paraphyses distinct, coherent, tips dark, whole hymenium with I + bluish.

On mica-schist in shaded places, Mt. Megunticook, Camden.

Very near *L. contigua* but sufficiently different to be a marked plant. Crombie gives the reaction as K—, C—. The hypothallus black and conspicuous.

Reported from Newfoundland in Macoun's list of Canadian Lichens, but unrecorded from the United States.

[Concluded in November number]

NOTICE OF ELECTION OF SULLIVANT MOSS SOCIETY OFFICERS FOR 1914

Members are requested to send ballots *at once* to Mrs. Eva B. Gadsby, 615 East Cheltenham Ave., Germantown, Penna., Judge of Elections. Balloting closes November 30th, 1913.

For President—Dr. A. W. Evans, New Haven, Conn.

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For Secretary-Treasurer—Mr. Edward B. Chamberlain, New York City.

Having recently engaged to contribute the treatment of the family *Ricciaceae* to the "North American Flora," I should be glad to receive for naming any material of this family that may be in possession of members of the Sullivant Moss Society or any that they may acquire during the coming year. For accurate determinations, specimens with mature spores are desirable, though not always necessary. Material preserved in fluids, or, better still, living material, is the most satisfactory for study, but ordinary dried herbarium specimens will be gratefully received. Most of the common kinds that grow on roadside banks, on compact soil beside paths or in open fields, or at the foot of sunny ledges, have a way of folding up and becoming very inconspicuous in dry weather, but just after a rain they commonly stand out in a way to catch the eye of any one who is looking for them. Except in a few localities the *Riccias* of North America have been very generally ignored or overlooked by collectors, and it is felt that a little additional attention to this genus on the part of American field-workers would yield results that would be wholly worth while.

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NOVEMBER 1913

THE BRYOLOGIST

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CONTENTS

North American Species of the Genus *Ramalina*.—Part II*R. Heber Howe, Jr. 81*

North American Flora, Vol. 15, Parts 1 and 2.

Sphagnaceae-Leucobryaceae

A. J. Grout 89

Noteworthy Lecideaceae from Knox County, Maine

[Concluded]

*G. K. Merrill 91**Brachythecium pacificum*, New Species*O. E. Jennings 95*

Shorter Notes

90

Exchange Department

96

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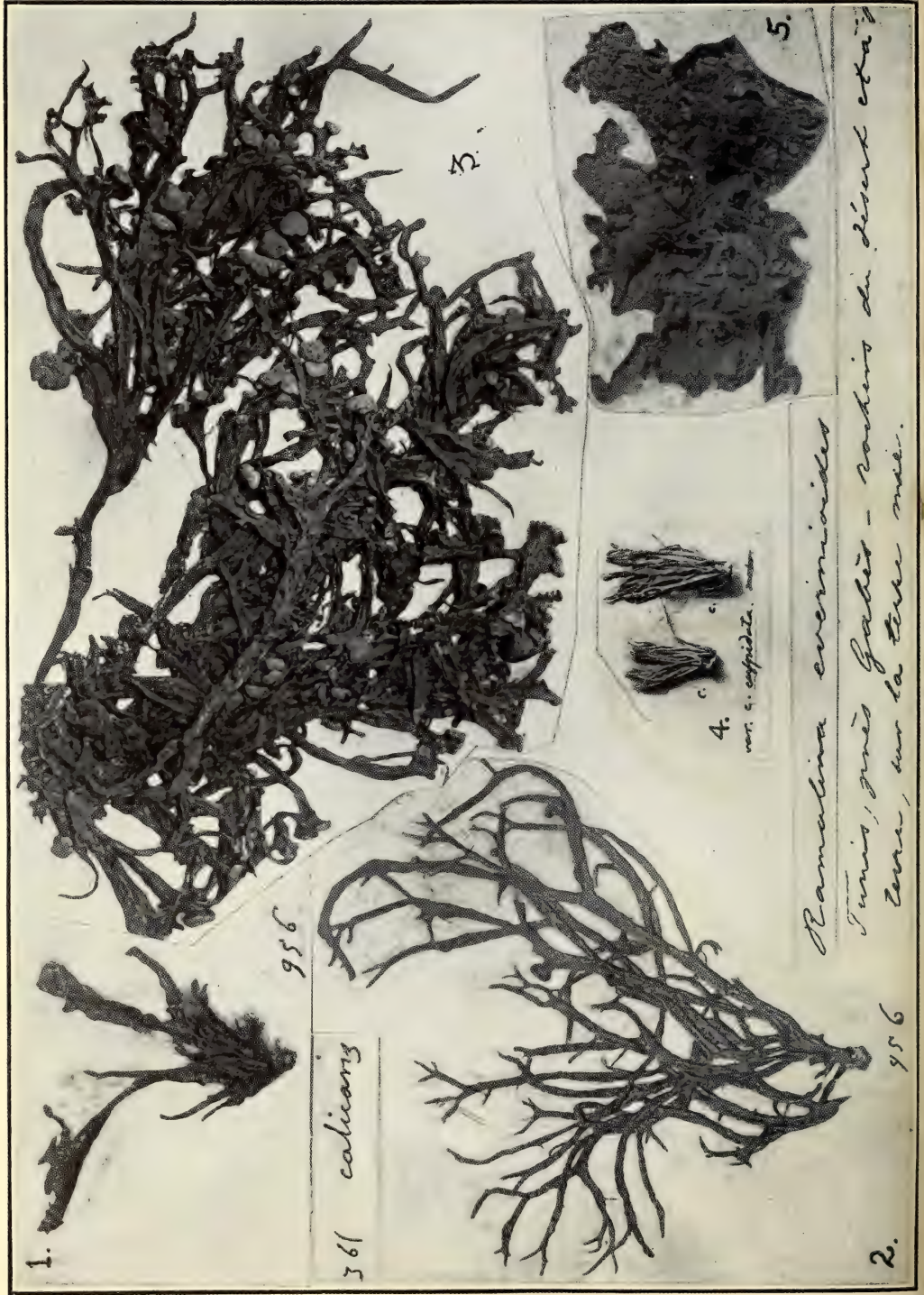
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1.

2.

5.

4.

var. *q. capitata* Mont.

361 calicans

956

956

2.

Ramalina evernioides

Tunis, près Gafes - rochers du désert et à l'écart, sur la terre meuble.

THE BRYOLOGIST

VOL. XVI

NOVEMBER 1913

No. 6

NORTH AMERICAN SPECIES OF THE GENUS RAMALINA.—PART II.

R. HEBER HOWE, JR.

SERIES: **Tenuicorticatae** ser. nov.

Medulla arachnoid, cortex thin (20–30 μ), hyphae not divaricate above gonidia.

KEY TO THE SERIES *Tenuicorticatae*

Thallus *with* wide reticulate sorediate laciniae

Laciniae *with* palmate-laciniate apices..... *crispatula*

Laciniae *without* palmate-laciniate apices..... *Duriaei*

KEY TO THE SERIES *Myelopoeae* (IN PART)

Thallus *without* wide, reticulate laciniae

Laciniae compressed, *non-linear*

Thallus rigid, soredia *granulate*

Apices *blunt*..... *polymorpha*

Apices *acuminate*..... var. *emplexata*

Thallus subflaccid, soredia *powdery*..... *pollinaria*

Subpulvinate..... var. *humilis*

Laciniae subcompressed, *linear*

Apices *simple*

Laciniae robust, branched, concolorous, KOH+..... *calicaris*

Laciniae slender, simple, black above, KOH—..... *cuspidata*

Apices multifid-sorediate, KOH+..... *subfarinacea*

Ramalina Duriaei (DeNot.) Bagl.

SYNONYMY: *Ramalina pollinaria* var. *Duriaei* DeNot. Frammenti Lich. Giorn. Bot. Ital. **2**: 216. 1846.

Ramalina Duriaei Bagl. Lich. In Sard., Giorn. Bot. Ital. **11**: 58. 1879.

Non *Ramalina evernioides* Nyl. Proc. Lich. Gall. et Agl. 47. 1857, also Act. Soc. Linn. Burdigal **21**: 293. 1857. = *Ramalina maciformis* Del.

Ramalina evernioides of many authors.

TYPE: Not traced. The type of *R. evernioides* is in the Museum d'Histoire Naturelle, Paris, not in the Cosson Herbarium, *fide* author.¹

¹ Type locality: "prope Gabes," Tunis, Africa. (On earth and rocks.)

Original description: "thallo albo vel albedo, sorediis vix ullis, crebre minuteque reticulatum rugoso, apotheciis pallidis demum majusculis." l. c.

The September number of THE BRYOLOGIST was published Nov. 22, 1913.

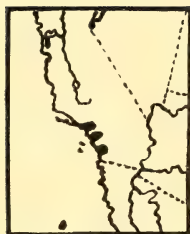


FIG. 1. Distribution of *R. Duriaei*.

TYPE LOCALITY: "Algeri" "sui rami."

ORIGINAL DESCRIPTION: "R. caespitosa, thallo foliaceo, chartaceo, fiacido, venoso-rugoso, areolatove, opaco, dilute glauco vel fulvo-lutescente, varie laciniato, segmentis cuneato-dilatatis, irregularibusve, polymorphis, margine lacero-fimbriatis, fimbriis dentiformibus vel elongatis, pinnatim digitatimve dispositis, difformibusque, facie, margine hinc inde, vel plerumque apice epidermide secedente albo-maculatis, vix vero pulverulentis; apotheciis sparsis sessilibus, basilata adnatis, tenuibus margine insigniter incurvato, tandem-eroso denticulato concavis, concoloribus, fulvescentibus; sporidiis cylindraco-oblongis, curvulis, diametro quadruplo longioribus." l. c.

FIGURE: Smith, Eng. Bot. *pl.* 1607 (upper figure). 1806.

DIAGNOSIS: *Thallus* caespitose, compressed, flaccid, *reticulate-rugose*, *apothecia* marginal, *spores* curved.

DESCRIPTION: *Thallus* caespitose (max. alt. 5 cm.), flaccid; stramineous to virescent; *cortex* reticulate-rugose, sorediate; *laciniae* compressed, expanded, lacerate, (max. 1 cm.), apices lobulate. *Apothecia* very rare (unobserved from our area), marginal, concave, marginate, disk buff or concolorous. *Spores* ellipsoid, curved, $\frac{10-15}{3.5-4.5} \mu$.

CONTINGENT PHASES: With orange cephalodia.

SUBSTRATA: On trees and shrubs. (Type of *evernioides* Nyl. on earth.)

DISTRIBUTION: Rare in the Austral to Transition Zone on the southern coast of California.

STATIONS: California: Santa Monica Mts.; Pasadena; Pt. Loma; San Diego; San Roque Island; Carpentaria. West Indies: St. Vincent.

OBSERVATIONS: This distinct, non-chondroid, corticolous species was first sent to me by Dr. H. E. Hasse from Pt. Loma, San Diego (BRYOLOGIST 13: 111. 1910.). This determination was confirmed by Dr. Bouly des Lesdain. It has since been reported from various stations and almost invariably bears orange cephalodia. Its expanded, membranous, laciniolate laciniae, completely reticulated-rugose, always distinguishes the species, though our plants have been previously determined as *Evernia prunastri*, *R. pollinaria*, the variety *humilis* of *polymorpha*, and even *testudinaria* by Nylander himself. There is a specimen in the U. S. National Herbarium determined by Dr. Farlow, labeled *homalea*, "abnormal form." Dr. H. E. Hasse (*in litt.*) states that he has collected the plant recently at Newport, Orange Co., and Palo Verde, Los Angeles Co., Cal. (Contr. U. S. Nat. Herb. 17: 108. 1913.)

NOTE: *Ramalina crispatula* Nyl. (Recog. mono. Ram. 154. 1870.)

The Abbé Hue (Lich. Cal. 1-2. 1905.) records this "rare espèce" from Laguna. Nylander diagnosed the species as follows: "Est quasi *R. evernioides* thallo crassiore (crassitie saepe 1-2 millimetrorum), plano-laevigato (rarius hinc inde scrobiculoso-inaequali vel plicato-rugoso), lacinoso, laciniiis apice palmato-

divisis subcrispis." 1. c. TYPE LOCALITY: "Canaria." The Abbé Hue kindly sent me this material for examination. The species appears to be a slightly more rigid plant with laciniate slender apices. In the present writer's opinion it could hardly rank higher than a variety of the former species. Most of our material is distinctly rugose, but well divided above and might in part be referred here. The Abbé Hue also records a form *minima* Hue (Lich. Extra-Eu. 63. 1901.) from Florida.

SERIES: *Myelopoeae* Wain. Class. Nat. et Morph. Lich. Brésil 16. 1890.

Medulla arachnoid, cortex thick (65–80 μ) hyphae divaricate above gonidia.

OBSERVATIONS: I am commencing the Series *Myelopoeae* with this species so that the question of the *calicaris* nomenclature may be settled at the outset, and am giving a diagnosis, etc., so that its true status may be made clear.

A. Cortex glabrous.

Ramalina calicaris (L.) Fr., Emend.

SYNONYMY: *Lichen calicaris* Linn. Spec. Plant. 2: 1146. 1753. As to name bringing synonymy, *Ramalina calicaris* (L.) c. *canaliculata* Fr. Lich. Europ. 30. 1831, not, however, as to plant described.

Ramalina scopulorum (Retz.) Ach. of most authors.

TYPE: In the Linnean herbarium, Burlington House, London, are six sheets of *Ramalina* specimens. Seven plants on these sheets were referred to by Dr. Wainio. Five he called *Ramalina calicaris* f. *canaliculata* Fr., and two *Ramalina scopulorum* (Retz.) Ach. Two of these sheets only may be considered to be types, as they alone are labeled in Linneus' handwriting, the others having been added to the herbarium from later sources. Those sheets labeled by Linneus bear the name and number of Species Plantarum, and also the Flora Suecica number (see figure). One small specimen of the first sheet though old and abraded probably represents the so-called *calicaris* stock, and cannot be referred to either the form *canaliculata* Fr. or *scopulorum* Retz. Though in two of its laciniae it suggests states of *fraxinea*, it cannot be said to bear out either Linneus' description or the Dillenian or Vaillant plates he cites, which all accord in the main. The other perfect specimen of this sheet and the remaining type of the other sheet are without doubt *scopulorum*, and the two specimens of this species referred to by Dr. Wainio.

If we now turn to the founder of the genus *Ramalina* we will see that Acharius placed *Lichen calicaris* of Linneus in his synonymy of *Ramalina scopulorum*. It was only later that Fries made *calicaris* L. synonymous with his variety *canaliculata*. Though it is difficult to drop a name as old as *scopulorum*, especially since a reliable type specimen exists in the Retzian herbarium at Lund (*vide* author), yet the fact that the Retzian figure-reference refers to a Dillenian plate unquestionably representing a *Roccella*, a much argued point, gives us added ground for so doing. It is true that the Dillenian herbarium proves by its composite specimens (*vide* author, *see* Crombie) that he, as has been said of Linneus, did not distinguish between *scopulorum* and *calicaris* (*sensu* Nylander). Never-

theless Linneus' description is quite diagnostic of Retzius' *scopulorum*, certainly more so than of *canaliculata*, as well it may be, judging from the material he labeled in his herbarium; and certainly Acharius' procedure is difficult to waive in favor of that of Fries, who seems to have followed certain less discriminating authors than Acharius.

TYPE LOCALITY: "Europae."

ORIGINAL DESCRIPTION: "foliaceus erectus linearis ramosus lacunosus convexus mucronatus." l. c.

FIGURES: Ach. Kong. Vet. Acad., Nya. Handl. 18: pl. 9 f. 2F. 1797. Westring, Svenska Lafrarnas Farghistoria, pl. 23, f. 13. 1805.

DIAGNOSIS: *Thallus* caespitose, compressed, linear, rigid, apothecia lateral, spores straight, KOH+.

DESCRIPTION: *Thallus* caespitose (max. alt. 20 cm.), rigid, cinerea-virescent; cortex nitidous, striate, sublacunose; *lacinae* branched, compressed, linear or sublinear, sulcate (max. width 6 mm.), apices attenuate. *Apothecia* marginal, mostly subterminal, subpedicellate, concave, at length convex, marginate finally immarginate (max. diam. 10 mm.), disk buff. *Spores* ellipsoid, straight, $\frac{12-19}{4.5-6.5} \mu$.

OBSERVATIONS: Though this species was included by Tuckerman on Nylander's authority (Synop. 1860) as found in North America, no material has been discovered in the herbaria examined. Nylander in 1870 included the allied species *cuspidata*, and other authors have cited this species in reference to our lichen flora. I believe, however, that the material from the Alaskan coastal islands which is generally referred here will be found to represent *Ramalina subfarinacea* Nyl., discussed below.

Ramalina cuspidata (Ach.) Nyl.

SYNONYMY: *Ramalina scopulorum* β *cuspidata* Ach. Lich. Univ. 605. 1810.

Ramalina cuspidata Nyl. Recog. Mono. Ram. 158. [60] 1870.

TYPE: In the Acharian herbarium, Universitetets Botaniska Institution, Helsingfors, *fide* author. Duplicate material in the Linnean Society Herbarium, Burlington House, London, *fide* author.

TYPE LOCALITY: "consortio cum priori (a)." i. e. "Suecia, Dania et Anglia."

ORIGINAL DESCRIPTION: "thallo caespitoso, ramis compressiusculis subsimplicibus erectis confertissimis laeviusculis subulatis, apicibus nigricantibus." l. c.

FIGURE: [Dill. Hist. Musco. pl. 17. f. 39a. 1741.]

DIAGNOSIS: *Thallus* caespitose, subcompressed, attenuate, rigid, apices black, apothecia subterminal, spores straight $\frac{10-18}{4-7} \mu$. KOH—.

DESCRIPTION: *Thallus* caespitose (max. alt. 8 cm.), rigid, cinerea-virescent; cortex nitidous, tuberculate, sublacunose, fistulous; *lacinae* subsimple to branched, subcompressed, apices terete, attenuate (black Ach.). *Apothecia* subterminal, concave at length convex, marginate finally immarginate (max. diam. 5 mm.), disk buff. *Spores* substraight, $\frac{10-18}{4-7} \mu$.

OBSERVATIONS: This species, attributed to North America in 1870, has since been referred to as a member of our lichen flora by Delamare and Macoun. Mr. Merrill was the first to question our material as *cuspidata*, thinking it more nearly referable to the tropical *Javanica* Nyl.¹ Though *cuspidata* may still be found in our area, I believe, as already stated that our plants will be found to be the boreal *subfarinacea*. Our material has the positive reaction KOH+. Nylander did not consider the often fistulous states of *scopulorum* and *cuspidata* a sufficient reason to include them in his "Stirps *Ramalina pusilla*," though he placed them directly before it. Some authors have failed to detect other than differing chemical reactions to separate these species. Acharius distinguished them on account of the present species having smaller, slender, attenuate, black-tipped laciniae; others claiming also a more tuberculate cortex for *cuspidata*. They are no doubt separable by the *Acharian* diagnosis.

Ramalina subfarinacea Nyl.

SYNONYMY: *Ramalina scopulorum subfarinacea* Nyl. Flora **30**: 426. 1872.

Ramalina subfarinacea Nyl. Flora **31**: 66. 1873.

Ramalina farinacea c. *angustissima* Anzi, Lich. Etrur. No. 6. 1863.

Nomen nudum.

Ramalina angustissima Wain. Not. syn. lich., Meddel. Soc. Fauna Fl. Fenn. **14**: 21. 1888.

TYPE: Not traced [Anzi, Lich. Etrur. No. 6, Fas. I. 1863.]

TYPE LOCALITY: "Coll del Pall, altit. 800 metr., in ipsis Hispanorum finibus." l. c. ["Florentiani Anzi."]

ORIGINAL DESCRIPTION: "Sporae longit. 0.012-15 millim., crassit. 0.004-6 millim." l. c. "laciniae are short and shfning, often pulverulento-sorediiferous." See Crombie, Journ. Bot. **10**: 74. 1872, also British Lich. 197. 1894.

FIGURE: None.

DIAGNOSIS: *Thallus* caespitose, *subcompressed*, attenuate, *rigid*, apices *multifid-sorediate*; apothecia marginal; spores straight. KOH + yellowish.

DESCRIPTION: *Thallus* caespitose (max. alt. 6 cm.), rigid, pale virescent; cortex nitidous, tuberculate, fistulous; *laciniae* subsimple or branched, subterete or subcompressed, apices generally multifid, sorediate, terete, attenuate. *Apothecia* uncommon, concave at length convex and gibbous, marginate finally immarginate, (max. diam. 4 mm.), disk buff. Spores ellipsoid, straight, $\frac{12-16}{4-7} \mu$.

CONTINGENT PHASES: Unobserved.

SUBSTRATA: Maritime rocks and tundra. [Cottonwood tree.]

DISTRIBUTION: Alaska.

STATIONS: Alaska: Atka Island; St. Paul's Island; St. George.

OBSERVATIONS: This species, suggesting *cuspidata* more strongly than the saxicolous states of *farinacea*, came to my notice through specimens collected by Mr. F. B. McKechnie during July, 1911.² As I have already said, I believe

¹ This is a subtropical species, and quite distinct.

² See Howe, Botanical Gazette. **53**: Dec., 1913.

questionable material referred heretofore to what has been known as the *scopulorum* stock belongs here. The species is distinguished by its rigid, pale, subterete laciniae, with their more or less multifid, sorediate tips.¹ Its non-costate laciniae separate it from narrow states of *polymorpha*,—its rigid cartilaginous thallus from *pollinaria*. The smaller states are separable from *intermedia* on account of their rigid multifid tips and thalline structure.

Ramalina polymorpha Ach.

SYNONYMY: *Lichen polymorphus* Ach. Kongl. Vet. Acad. Nya. Handl. 18: 270. 1797.

Ramalina polymorpha Ach. Lich. Univ. 600. 1810.

Ramalina polymorpha a. *ligulata* Ach. Meth. Lich. 265. 1803.

TYPE: Though apparently no specimen labeled *Lichen polymorphus* is now in the Acharian herbarium, Universitetets Botaniska Institution at Helsingfors, there exists authentic Acharian material representing all his varieties, *vide* Dr. Fred. Elfving.

TYPE LOCALITY: "in insulis sinus Botnici Ostro-Gothiae Up-landiae Smolandiae." i. e. Scandinavia.

ORIGINAL DESCRIPTION: "subcartilagineus erectiusculus rigidus compressus laciniato-ramosus polymorphus pallide lutescens; lacunulis sparsis fariniferis; glomerulis scutellisque congestis terminalibus." l. c.

FIGURE: Ach. Kongl. Vet. Acad. Nya. Handl. 18: pl. 11: f. 3, A-Z. 1797.

DIAGNOSIS: *Thallus* caespitose, compressed, *sublinear*, rigid, *longitudinally rugose*, *granular-sorediate*, apothecia marginal, spores straight.

DESCRIPTION: *Thallus* caespitose (max. alt. 4 cm.), rigid, virescent at length stramineous; *cortex* glabrous, often foraminous, longitudinally rugose, granular-sorediate; *laciniae* subsimple, compressed, attenuate, apices obtuse. *Apothecia* rare, marginal concave, marginate (max. diam. 8 mm.), disk buff. *Spores* ellipsoid, straight or substraight, $\frac{11-16}{4-5} \mu$.

CONTINGENT PHASES: Unobserved.

SUBSTRATA: On maritime (and alpine) rocks.

DISTRIBUTION: Rare in the Boreal Zone on the Alaska Peninsula and Islands, and perhaps southward.

STATIONS: Alaska: Arakamtchetchere Island. Washington: Friday Harbor.

OBSERVATIONS: This saxicolous species, of which Tuckerman had seen no typical specimens, must be included, if only on the ground of the Acharian material, which includes a specimen from "Amer. bor."² This specimen he referred to his variety *ligulata* which is inseparable from his type, as has been

¹ Fertile examples are esorediate and less multifid.

² The following records are also included in our literature: Arctic America, *Richardson*. Alaska, *Rothrock* and *Cummings*; Maine, *Eckfeldt*; Minnesota, *Fink* = *humilis* (See Contr. U. S. Nat. Herb. 14: 205. 1910); New York, *Halsey*; New Hampshire, *Howe*, *vide* *Wheelock*; Newfoundland, Cape Breton, Alaska, Anticosti, Prince Edwards Island, Nova Scotia, Quebec, Alaska, *Macoun*; Massachusetts, *Cummings*; Pennsylvania, Newfoundland and Labrador, *Eckfeldt*; *Muhlenberg*; and New England, *Tuckerman*. But few of these records are supported, however, by authentic material.

pointed out by Nylander. *Polymorpha* is to be distinguished from *pollinaria* on account of its larger, rigid thallus, *completely longitudinally costate*-rugose laciniae, and its always *granular* soredia. The membranous, inflated, at length powdery-sorediate apices of the flaccid laciniae of *pollinaria* served to distinguish it from the present species, which seems to be invariably saxicolous and generally maritime. The at first granular soredia and often partially rugose laciniae of specimens of *pollinaria* var. *humilis* often lead one to determine such plants as *polymorpha*. The material from Yukon (Bull. Torr. Bot. Club 38: 292. 1911.) was determined by the author as this species. The specimens were collected on "Slide Rock," are granulate-sorediate, but their small sized, subpulvinate, flaccid, subrugose laciniae make me believe that they should be referred to *humilis*.

Ramalina polymorpha var. *emplecta* Ach.

SYNONYMY: *Parmelia polymorpha* ε. *emplecta* Ach. Meth. Lich. 267. 1803.

Ramalina polymorpha ξ *emplecta* Ach. Lich. Univ. 601. 1810.

TYPE: In the Acharian herbarium, Universitetets Botaniska Institution, Helsingfors, *fide* author.

TYPE LOCALITY: Not given.

ORIGINAL DESCRIPTION: "lacinii erectis teretiusculis ramosissimis, ramis tenuissimis pulverulento-scabridis acuminatis." l. c.

FIGURE: Ach. Kongl. Vet. Acad., Nya Handl. 18: pl. 11, f. 3. P. Z.

DIAGNOSIS: *Thallus* caespitose, compressed, laciniae *much branched*, apices *slender and acuminate*.

DESCRIPTION: *Thallus* caespitose (max. length 5 cm.), rigid, virescent at length staminate; *cortex* glabrous, often foraminous, longitudinally rugose, granular-sorediate; *laciniae* much branched, compressed, apices acuminate. *Apothecia* unobserved.

SUBSTRATA: On maritime rocks.

DISTRIBUTION: St. Paul's Island, Alaska.

OBSERVATIONS: Nylander (Enum. Lich. Freti Behr. 85. 1888.) states that Dr. Bean's specimen, recorded as the type species by Rothrock (Proc. U. S. Nat. Mus. 7: 1. 1884.), is referable to this variety and constitutes our only record. The variety is characterized by its many slender, acuminate apices.

Ramalina pollinaria (Westr.) Ach.

SYNONYMY: *Lichen pollinarius* Westr. Kong. Vet. Acad., Nya Handl. 1795 (publication date 1794, *fide* Ach.).

Ramalina pollinaria Ach., Lich. Univ. 608. 1810.

TYPE: Westring type unknown. In the Acharian herbarium, Universitetets Botaniska Institution, Helsingfors, are the varietal types, *fide* Dr. Fred. Elfving.

TYPE LOCALITY: Sweden?

ORIGINAL DESCRIPTION: "foliaceus erectus cespitosus: foliis divis sublacunos polline conspersis; peltis terminalibus concoloribus." l. c.

FIGURE: Ach. Kong. Vet. Acad., Nya Handl. 18: pl. 11, f. 2F. 1797.

DIAGNOSIS: *Thallus* caespitose, compressed, *flaccid*, apices bursting with *powdery-soredia*, apothecia subterminal; spores straight.

DESCRIPTION: *Thallus* caespitose (max. alt. 1.5 cm.), *flaccid* or subflaccid, stramineous to virescent; *cortex* rarely rugose *below*, powdery-sorediate; *laciniae* compressed, lacerate (max. width 4 mm.), apices vaulted or bursting, with white farinose soredia. *Apothecia* rare, subterminal, concave, margined (max. diam. 3 mm.), disk buff. *Spores* ellipsoid, straight or substraight, $\frac{10-13}{4-6} \mu$.

CONTINGENT PHASES: (a) *Laciniae* short subpulvinate (max. alt. 16 mm.) lacunose, scattered with soredia (= *R. pollinaria* β . *humilis* Ach. Lich. Univ. 609. 1810. TYPE at Helsingfors. ORIG. DESCRIPT.: "laciniiis aggregato-complicatis brevibus lacero-laciniatis, furfum passim latioribus glauco cinerascentibus pulverulentis, maculis lateralibus soredi formibus latissimis confluentibus pulveraceis." l. c.)

SUBSTRATA: On trees, rarely on rocks = *humilis*.

DISTRIBUTION: Very rare in the Upper Transition to Boreal Zone from California and New Mexico to the Yukon.¹

STATIONS: Yukon, Dawson. New Mexico. Minnesota, Palisades. California, Pasadena; San Jose. Rhode Island. Massachusetts, Beverley, Salem. Vermont, Mt. Mansfield.

OBSERVATIONS: This generally corticolous species was evidently confused by Tuckerman with forms of *farinacea* (*intermedia* = New England records). I have little typical material from our area.² This species may be distinguished by its *subflaccid* *laciniae* which never show throughout longitudinal parallel rugae as in the more rigid maritime *polymorpha*. The inflated tips with generally white powdery non-granulate soredia offer another good character for determination. The phase or variety *humilis* is the plant found in our area and is more difficult to distinguish from *polymorpha*, yet it differs in several points. Though its *laciniae* are lacunose, they are never parallel-rugose *throughout*, never rigid, and always with bursting sorediate apices. *R. humilis* is subpulvinate, and scattered with granulate and confluent soredia, and thus approaches *polymorpha*. This latter character, as I have already said, caused me to mis-determine the plants collected in the Yukon. Mr. Merrill has reported this phase from San Juan Islands, Washington (BRYOLOGIST 11: 51. 1908). Other authors have recorded it as follows: Ohio, *Fink* and *Bogue*; Maine, *Eckfeldt* and *Harvey*; South Dakota, *Fink*; Newfoundland and Labrador, *Eckfeldt*; New Mexico, *Tuckerman*; California, *Hasse*; New Hampshire, *Howe* *fide* *Wheelock*; Massachusetts, *Sprague*; and *Cummings*; New York, *Harris*; North Carolina, *Merrill*; Newfoundland, *Arnold*; and Alaska, *Macoun*. This species is still hardly more than a hypothetical member of our flora; it having never occurred in a fertile or absolutely typical state. Its exact range is uncertain.

[To be continued.]

¹ No distributional maps are given for species whose range cannot be definitely defined.

² See Merrill, BRYOLOGIST 14: 36. 1911.

var. *flabellulata*. L. u.
6. *strepilis*.
stricta. L. u.

1.

amer. bon Muhl.
d. ligulata.

८.

Madras 2

Lucia.

Karnalina polymorpha.

capitata. L. U.

Ramalina polymorpha

c. complexa.

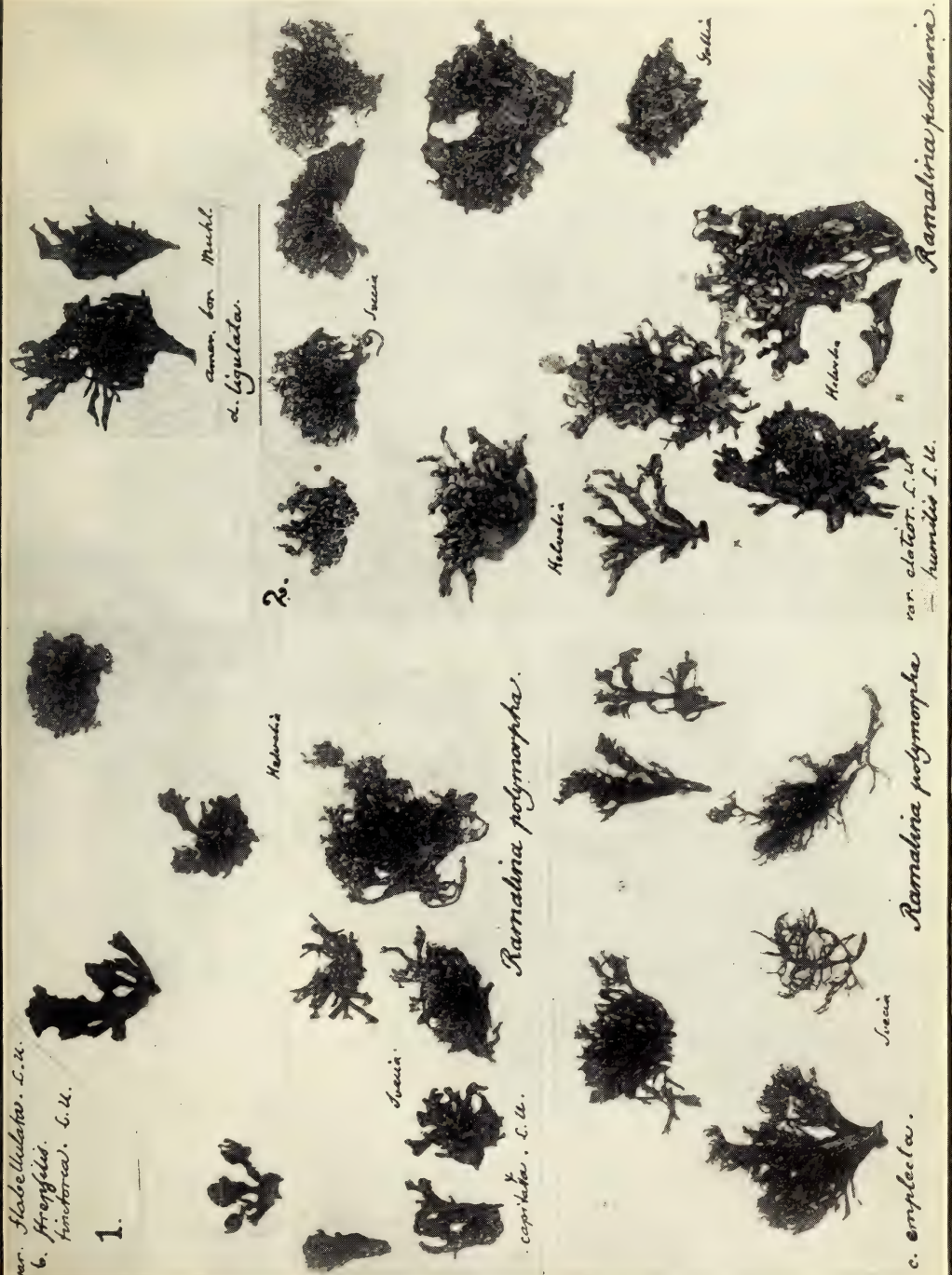
var. *clatior* L. W.
— *humilis* L. W.

Ramalliria pollinaria.

Gallia

Hederaea

Helvetic



EXPLANATION OF PLATES VIII-IX

Plate VIII

1. The dubious Linnean type of *Ramalina calicaris* at London. (Nat. size.)
2. One of the determinable Linnean types of *Ramalina calicaris* at London.
3. The Retzius type of *Lichen scopulorum* at Lund. (Nat. size.)
4. Acharian authentic material of *Ramalina scopulorum* var. *c. cuspidata* at London. (Slightly reduced.)
5. The Nylander type of *Ramalina evernioides* at Paris. (Nat. size.)

Plate IX

1. The Acharian types of *Parmelia polymorpha* and the varieties *flabellulata*, *strepsilis*, *tinctoria*, *capitata*, *ligulata*, and *emplecta* at Helsingfors. (Nat. size.)
2. The Acharian types of *Ramalina pollinaria* and the varieties *elator* and *humilis* at Helsingfors. (Nat. size.)

NORTH AMERICAN FLORA, Vol. 15, Parts 1 and 2

Sphagnaceae—Leucobryaceae.

Every student of North American Mosses has looked forward with eagerness to the appearance of Volume 15, and the two parts already issued will receive a warm welcome.

Part 1 includes the *Sphagnaceae* by Albert LeRoy Andrews, the *Andreaeaceae* by Elizabeth Gertrude Britton and Julia Titus Emerson, also the *Archidiaceae*, *Bruchiaceae*, *Ditrichaceae*, *Bryoxiphiaceae*, *Seligeriaceae*, by Mrs. Britton. Part 2, *Dicranaceae*, *Leucobryaceae*, by Robert Statham Williams.

The style and arrangement, the exclusiveness and inclusiveness are in keeping with the other parts already published. No work on North American mosses has ever been so inclusive or complete, as the range includes all the Americas except South America and adjacent islands.

The arrangement of families and genera in the main follows Engler and Prantl, but the subfamilies of the *Dicranaceae* are in many cases raised to family rank, a procedure that is of questionable desirability.

The conservative attitude shown in the matter of creating new species will meet with general approval we feel sure. The number of new species is very few—seven were all that were noted—and these were from the little explored regions of the range.

Linnaeus, 1753, is taken as the starting point of binomial nomenclature in mosses as in flowering plants and there are no startling innovations in nomenclature. Most of the names used that differ from those in our earlier literature have become fairly familiar to those who have used recent publications on North American mosses.

From the writer's point of view the work could be improved in usefulness along two important lines; by the description of many more of the important variations, either as forms or varieties and by the more abundant use of critical and comparative notes. It may be added that this is not an oversight on the part of the editors, but a deliberately prejudged plan. However, the authors have been allowed considerable individuality. Dr. Andrews describes six varieties in connection with thirty-nine species of *Sphagnum*, but he gives practically no notes. Fortunately Dr. Andrews has furnished the readers of THE BRYOLOGIST with very much more exhaustive notes than would have been possible in this work. We hope that the other authors will somewhere publish a similar set of notes as they must be in possession of much valuable information that will perish with them unless it is published outside the North American Flora.

Mrs. Britton's work shows almost no notes, two varieties under *Ditrichum* and four forms under *Ceratodon purpureus*.

Mr. Williams has inserted frequent notes of the greatest helpfulness, but recognizes no varieties and does not describe forms. *Dicranella heteromalla orthocarpa* (Hedw.) E. G. B. is not even differentiated as a form, but the species is described as having the "capsule erect or nodding . . . usually more or less curved and becoming furrowed and contracted under the oblique mouth when dry and empty." Surely such omissions are not helpful, as the straight-capsuled form is overwhelmingly preponderant along the Atlantic seaboard and correspondingly infrequent inland, at least in New England.

The reduction of *Dicranum viride* to *D. fulvum* will come as a surprise to most of us. It may be that intergrading forms are more abundant than has been supposed. The writer's limited experience with the two species has shown *D. fulvum* as an exclusively rock-growing species and *D. viride* as usually found on decayed wood.

Whatever adverse criticisms may have been made above, it is in no way meant to belittle the great and lasting value of the work. At no other time or place in the history of American botany has there ever been such an abundance of material for producing a complete and authoritative work on North American mosses and there is every indication that this wealth of opportunity has been used skillfully and conscientiously. For the student of our mosses Volume Fifteen will have no equal or substitute.

A. J. GROUT.

We learn that the valuable European moss collection of Dr. G. Schellenberg, Berlin-Steglitz, Zimmermannstrasse 9/II, embracing about 20,000 numbers is now offered for sale.—EDITOR.

It has been suggested by Mrs. Annie Morrill Smith that an informal gathering of those members of the Sullivant Moss Society who may attend the coming Atlanta meeting of the A. A. A. S. would be a very pleasant occasion. This is worth bearing in mind.—EDITOR.

NOTEWORTHY LECIDEACEAE FROM KNOX COUNTY, MAINE

[Concluded]

G. K. MERRILL

LECIDEA SYLVICOLA Flot. Lich. Siles. No. 171. (1829).

Thallus effuse, very thin, granulate, commonly dusky-gray, or at times obsolete. Apothecia small, scattered or congregated, black, opaque, plane, with an inconspicuous margin, or convex and immarginate. Spores 8, ellipsoid, 6-10 x 3-4.5 μ , hymenium bluish, hypothecium black or dark brown, paraphyses distinct, compacted, the tips dark bluish or greenish.

On mica-schist in unshaded pastures, Rockport; granite and dead wood, So. Thomaston.

Dr. Fink, in Lichens of Minnesota, p. 74, finds it difficult to separate the present from *Biatora myriocarpoides* (Nyl.) Tuck. It is possible to go further and assert that the two species are identical with *Lecidea cyrtidia* Tuck., for it is only occasionally that the latter affords characters making for separation. Dr. Fink states that he finds *Biatora myriocarpoides* occurring on rocks in Minnesota, but that the specimens when submitted to Dr. Hedlund were pronounced representative of *Lecidea sylvicola*. An abandoned granite quarry in So. Thomaston recently furnished to the writer curious evidence of an identity between the two species. On a heap of broken rock covered with *L. sylvicola*, a rotten plank was found that bore in patches over its whole upper surface what, in the absence of the rock lichen beneath, one would call perfectly good *Biatora myriocarpoides*. The two plants were absolutely in agreement both internally and externally. It is, however, very doubtful if *Biatora myriocarpoides* of Tuckerman's Synopsis is in exact agreement with Nylander's *Lecidea myriocarpoides*, and for the present it is preferred to ally the lignicoline So. Thomaston form with the associated *Lecidea sylvicola*.

LECIDEA CRUSTULATA forma GEOGRAPHICA Cromb. Mon. Brit. Lich. Pt. II, p. 71. (1911).

On a rock, Warren, and on ledges, Rockport.

Thallus decussated by dark hypothalline lines, but otherwise not differing from the species. Previously unrecorded for America.

LECIDEA GONIOPHILA (Flk.) Schaer. Enum. p. 127. (1850).

Thallus effuse, leprous, cinereous, or at times subevanescent. Apothecia small, scattered or aggregated, plane or convex, with a thickened and obtuse margin, disk naked and black. Spores 8, ellipsoid, 10-14 x 5-9 μ , hypothecium colorless or faintly fuscous, paraphyses distinct, compacted, tips more or less colored and sometimes blackish.

On flat-topped boulders by the roadside, Camden and Warren.

The description of this species is that of *Biatora pungens* Koerb., given by Nylander in Flora 1878, p. 248, as a synonym. *L. goniophila* is reported from Minnesota by Dr. Fink, but the description in his work on the Lichens of Minnesota fails to fit the plant as here affirmed. Dr. Fink states that Hedlund deter-

mined a specimen from Minneapolis, on sandstone, as *L. goniophila*, and a fragment in my herbarium from what is taken to be the locality mentioned, labeled *L. goniophila* and communicated by Dr. Fink, undoubtedly belongs with the species.

LECIDEA (*Buellia*) VERRUCULOSA (Borr.) Schaer. Enum. p. 114. (1850).

Thallus small, orbicular or irregular, verruculose-areolate, the areola more or less scattered toward the circumference, yellowish-green varying to fuscous, K—, C + orange-red. Apothecia immersed in the thalline verrucae, small, disk plane, black. Spores 8, ovoid or ellipsoid, bilocular, brown, 15–21 x 8–11 μ , hypothecium brown, fuscescent or sometimes pale, paraphyses distinct, coherent, brown at the tips, hymenial gel. with I + deep blue.

On rocks in walls and in rock heaps, Rockland.

Apothecia, one in each thalline verruca, and with a spurious thalline border.

Reported from Newfoundland, but I know of no record for the United States. Issued in Lichenes Exsiccati Merrill No. 250.

LECIDEA (*Buellia*) MYRIOCARPA var. PUNCTIFORMIS (Hoffm.) Lamy Mont-Dore, p. 139. (1880.)

On old bricks, Warren, and lignicoline in Thomaston.

Thallus on bricks a filmy sub-dendritic stain. Apothecia very minute. Spores 8, agglutinated, bilocular, ellipsoid, not constricted at the septum, 10–14 x 6–7.5 μ , hypothecium brownish, asci ventricose, paraphyses distinct, thickened, tips clavate and brown.

Not previously reported from the United States under this combination, but recorded from Newfoundland as *Buellia punctiformis*. Tuckerman made no attempt to differentiate the various forms of the species.

LECIDEA (*Buellia*) TURGESSENS Nyl. in Tuck. Gen. p. 187, and Syn. Pt. II, p. 98. (1888.)

On old clapboards, Rockport.

This is the common condition of the species from a lignicoline substratum. A plant found on white pine in Brunswick, has a conspicuously plicate-verrucose brown thallus and is the finest example of the species yet examined. The thallus is effuse, incrassated centrally, but diminishing in thickness to the filmy-olivaceous border. The apothecia appear as if immersed, due to the turgid thallus. LECIDEA (*Buellia*) ATHALLINA Naeg. MSS ex Dr. Hepp in litt. Müller.

Princ. Class. des Lich., Mem. Soc. Phys. Hist. Nat. Genève 16: p. 404. 1862. *Buellia* Müll.

Parasitic, apothecia small, black, opaque, epruinose, with a persistent and rather thin margin. Spores 8, bilocular, from pale to deep brown, 12–13 x 3.5–5 μ , hypothecium blackish-brown, asci ventricose-clavate, paraphyses distinct but gelatinous, tips clavate and faintly colored.

On thallus of *Baeomyces rufus*, No. Haven.

Answering better to Müller's description than to any found for *L. scabrosa*. The spores in our plant appear not to be constricted at the septum, and are slightly longer and narrower than those of *L. scabrosa*. The paraphyses agree perfectly with Müller's figure. In any broad view the plant is synonymous with *L. scabrosa*.

New by name to the United States.

LECIDEA (*Rhizocarpon*) **ALBOATRA** var. **EPIPOLIA** (Ach.) Schaer. Enum. p. 122. 1850.

Thallus whitish, friable and areolate, firm and rimulose, or continuous and unmarked, effuse or limited, destitute of hypothallus in the American specimens examined. Apothecia small, more or less immersed, plane with a thin margin or convex and immarginate, disk black, sometimes bluish or whitish-pruinose. Spores 8, ellipsoid, from one varying to three-septate, and submuriform, $18-22 \times 7-11 \mu$, nearly colorless or brown, hypothecium brown, paraphyses distinct, tips clavate and blackish-brown.

On calciferous conglomerate, near the tide water, No. Haven.

The var. *b. saxicola* Fr. is little different, but our plant is without hypothallus.

LECIDEA (*Rhizocarpon*) **EUPETRAEA** Nyl. Flora 1870, p. 36.

Thallus limited or effuse, granulate-verruculose, thin, the black hypothallus here and there visible, ashy or ashy-fuscescent, K + > dark rusty-red. Apothecia rather small, scattered, commonly slightly convex with a thin persistent margin, black. Spores oblong-ellipsoid, fuscous or decolorate, apparently without halo, muriform, septa irregular, $20-25 \times 10-14 \mu$, hypothecium dark-brown, paraphyses and asci gelatinous, epithecium infuscate.

On fragmental stones on earth, and rocks of walls, Rockport.

Nylander compares this species externally to *L. petraea*, and Hue, in Ad-denda, to *L. parapetraea*. It is unlike the common states of *L. confervoides* from this region in color and conditioning of the thallus, but is analogous in color and granulated crust to one form of *L. concentrica*. The species is reported from Miquelon, Hue; and from Labrador, Arnold. In Eckfeldt's Newfoundland and Labrador list it is noted as *L. empetraea*, and in Macoun's Canadian list the spelling is again incorrect. New to the United States.

Lecidea (*Rhizocarpon*) **confervoides** forma **dispersa** (Leight.) comb. nov.

L. petraea f. *dispersa* Leight. Lich. Fl. G. Brit. Ed. III, p. 376.

On ledges, Rockport.

Hypothallus conspicuous, the thalline areolae scattered and ashy. Apothecia seated on the hypothallus. *L. confervoides* is in part *Buellia petraea* of Tuckerman's Synopsis. Unnoticed in American lists.

LECIDEA (*Rhizocarpon*) **OBSCURATA** (Ach.) Schaer. Spiclg. p. 130. 1828.

Thallus grayish, thin, areolate, the areolae small and never discrete in our specimens, plane, K + faint, C—, hypothallus black but not always visible. Apothecia small to medium, innate-sessile, plane or slightly concave, disk black with a rather thickened obtuse margin. Spores variable in number, oblong ellipsoid, colorless or fuscous, muriform, halonate, $26-45 \times 13-20 \mu$, hypothecium gel. with I + deep blue.

On rocks in bed of a stream, but mostly about its margins, Camden.

A curious feature of the Knox Co. specimens is the often concentric arrangement of the apothecia, exactly in the manner of *L. concentrica*.

The plant is noticed in Macoun's Canadian list, and in the Newfoundland catalogue of Eckfeldt. Dr. Fink records it from Minnesota, but I find no other record for the United States.

LECIDEA OBSCURATA forma FERRATA Nyl. Scand. p. 234. (1861.)

Like the species in all except color. The thallus is rusty-red, and the apothecia are likewise suffused.

On submerged rocks in a stream, and rarely about its borders, Camden.

Apothecia concentrically disposed. The plant when wet is of a brighter color than in its dried state, and is a rarely pretty object. Unreported from America.

LECIDEA (*Rhizocarpon*) AMPHIBIA Fr. Vet. Ak. Handl. 1822. p. 262.

Thallus verrucose-areolate, the areolae contiguous, bluish-cinereous K—, C— hypothallus obsolete. Apothecia at first immersed, but becoming emergent, small or medium, disk black, plane or more commonly convex with a thin persistent margin. Spores various in number, oblong or oblong-ellipsoid, from rarely three-septate commonly muriform, colorless or fuscous, more or less halonate, $26-36 \times 13-16 \mu$, hypothecium brownish or nigrescent, paraphyses confused, tips variously yellowish or violet, hymenial gel. with I + intense blue.

On schistose rocks, summit of Ragged Mt., alt. 1400 ft., Rockport. In our plant the apothecia are concentrically disposed. The specimen was not found near a stream or lake, such being the habitat given for the species in Europe, but on a bare ledge having a southern exposure. Curiously *L. obscurata*, not particularly a water-loving plant, is here noted as inhabiting brooks, while the present, given a name for its predilection for a moist home, is found where the only moisture is derived from rains and fogs. The determination is certain, however. In our specimens the spores are muriform, colorless, and in four's. No record is found for the United States.

LECIDEA (*Rhizocarpon*) LAVATA (Ach.) Nyl. Flora. 1873. p. 13.

Thallus thin, continuous and rimulose or somewhat diffract-areolate fusco-cinereous, K—, C—. Apothecia depressed, typically innate, circumscribed, concave, with an elevated and persistent margin, or the disk plane and margin subevanescent, black. Spores 8, oblong-ellipsoid, muriform, colorless, faintly halonate, $33-35 \times 11-15 \mu$, hypothecium brownish or fuscous, paraphyses distinct but gelatinous.

On granite and quartz rock, So. Thomaston.

The species is also identified in material from Vancouver Island collected by Mr. J. Macoun.

LECIDEA (*Rhizocarpon*) ALPICOLA (Wahl., Schaer.) Nyl. in Act. Soc. Linn.

Bord. ser. 3, I., p. 388. 1856.

On granite, Ragged Mt., Rockport, alt. 1,100 ft.

This species is wholly inseparable from *L. geographica* except by its spores, and the Sporologists notwithstanding, belongs in the same section of *Lecidea*. It is unknown in the United States except from a Nevada station, and from the higher summits of the White Mountains of New Hampshire. Tuckerman states that the thallus is coarser than is that of *L. geographica*, and that the apothecia are detruded. Our plant is certainly coarser than the *L. geographica* of our region, but curiously less coarse than many examples of *L. geographica* collected on the summit of Mt. Washington, and the fruit is not markedly detruded.

ROCKLAND, MAINE.

BRACHYTHECIUM PACIFICUM, NEW SPECIES¹

O. E. JENNINGS

Brachythecium pacificum, sp. nov.—Rather densely cespitose, lustrous, light green, becoming yellowish-green in the older parts: stems slender, reaching a length of 11 cm. or more, prostrate, castaneous-radiculose; branches more or less regularly pinnately arranged, ascending or erect, reaching about 2 cm. in length; stem-leaves spreading, deltoid-ovate from a somewhat decurrent base, length;

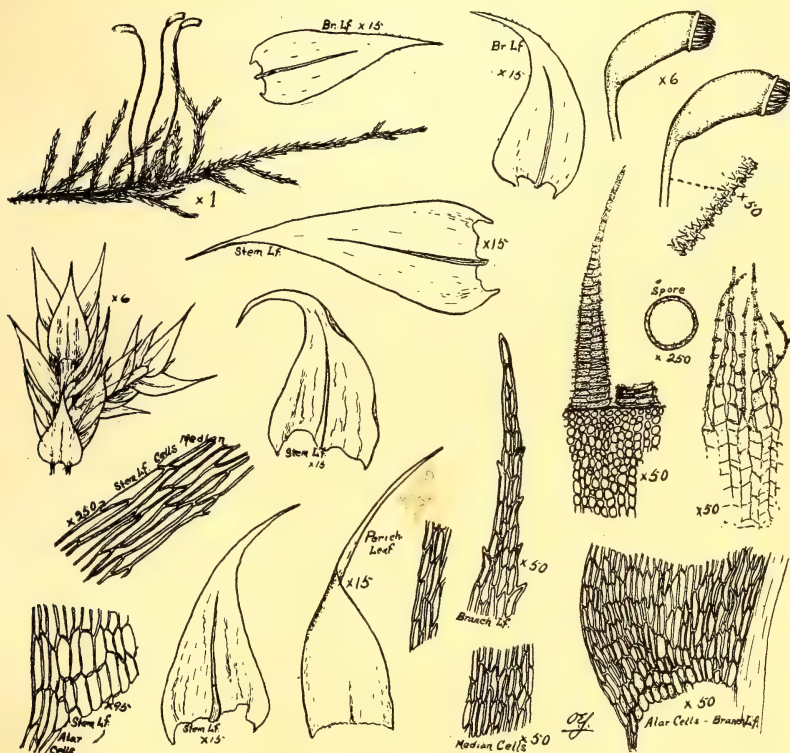


Fig. 1. *Brachythecium pacificum* Jennings

concave, gradually and slenderly acuminate, strongly plicate when dry, moderately so when moist, about 1.8–2.4 mm. long, 0.9–1.1 mm. wide, moderately auriculate, entire-margined (or very faintly serrate); costa strong, ending slightly above the middle of leaf; median leaf-cells linear, prosenchymatous, about 6–7 μ wide by 45–70 μ long, medium-walled, the basal larger and colored at in-

¹ Published by permission of the Director of the Geological Survey of Canada.

sertion of leaf, the alar hyaline and more or less inflated-rectangular to rhomboid; branch-leaves ovate, rounded at the base, decurrent, concave, erect-spreading, not markedly plicate, entire to slightly serrate at the apex, strongly costate to slightly above the middle, about 1.5–2 mm. long by 0.6–0.9 mm. wide, slenderly acuminate; leaf-cells of branch-leaves similar to those of the stem-leaves, the median cells being often relatively shorter; perichaetial leaves ecostate or sometimes slightly colored-striate at the base, clasping below, abruptly narrowed above into a slender, elongate, entire, spreading acumination: seta 2–2.4 cm. long, rich castaneous, flexuous-erect, twisted, slender, strongly papillose throughout; capsule castaneous, 1.9–2.1 mm. long, 0.7–0.8 mm. thick, horizontal or slightly ascending, arcuate, constricted below the mouth when dry, oblong-cylindric; operculum and calyptra not seen; peristome normal for the genus, the segments split and widely gaping, the basal membrane about two-fifths the height of inner peristome, the cilia 1 or 2, about as long as the segments, very slender and quite distinctly appendiculate; spores yellowish, rather thick-walled, about 19–23 μ in diameter. Antheridia not found.

TYPE: Deposited in the Herbarium of the Carnegie Museum, Pittsburgh, Pa. No. 83,402, Herb. Geol. Surv. Canada, Plants of Queen Charlotte Islands. Collected at Skidegate, July 1, 1910. W. Spreadborough. No. 83,383 of the same collection and with same data is evidently the same species.

By the courtesy of Prof. J. M. Macoun, Curator of the Herbarium of the Canadian Geological Survey, the writer recently had the pleasure of examining a set of mosses collected in 1910 on the Queen Charlotte Islands, off the northern coast of British Columbia, by W. Spreadborough. The specimens described above as a new species approach quite closely *Brachythecium subasperrimum* Card. & Thér. (Bot. Gaz. 37: 377–8. 1904.), but are considerably larger in vegetative characters, the spores also being mostly over 20 μ in diameter as against 15 μ for *subasperrimum*, the branch-leaves being somewhat decurrent, most of the leaves being quite entire, and but few of the leaves being plicate when moist. The writer has therefore thought best to propose a new species. The accompanying figure is self-explanatory.

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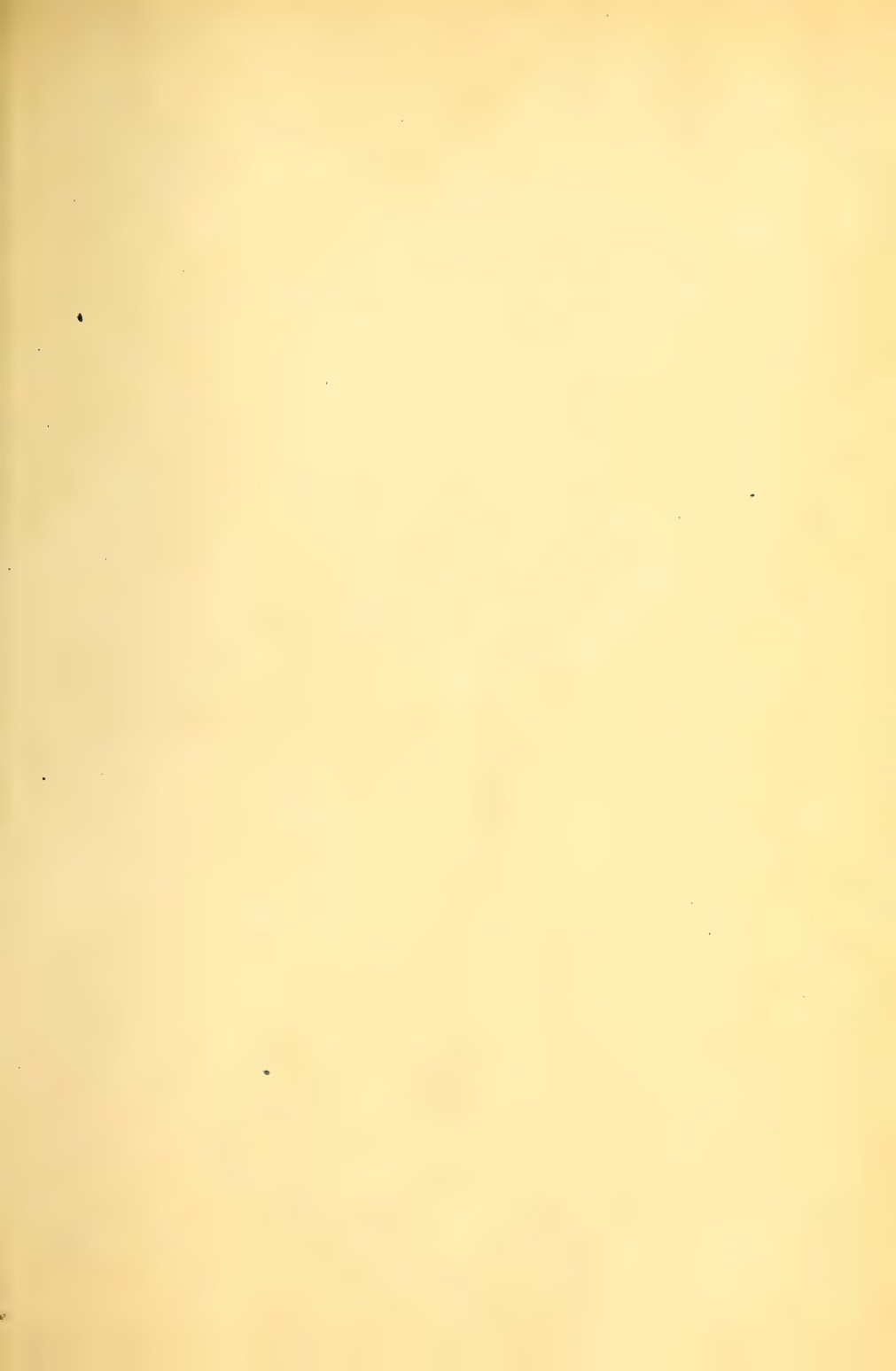
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